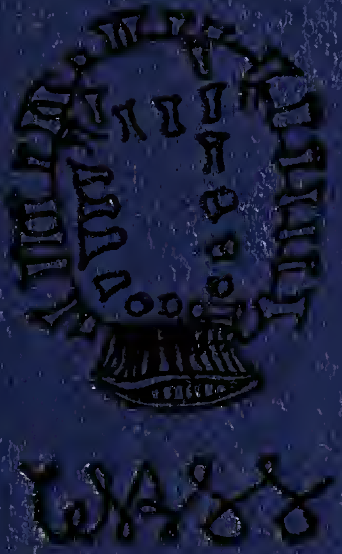
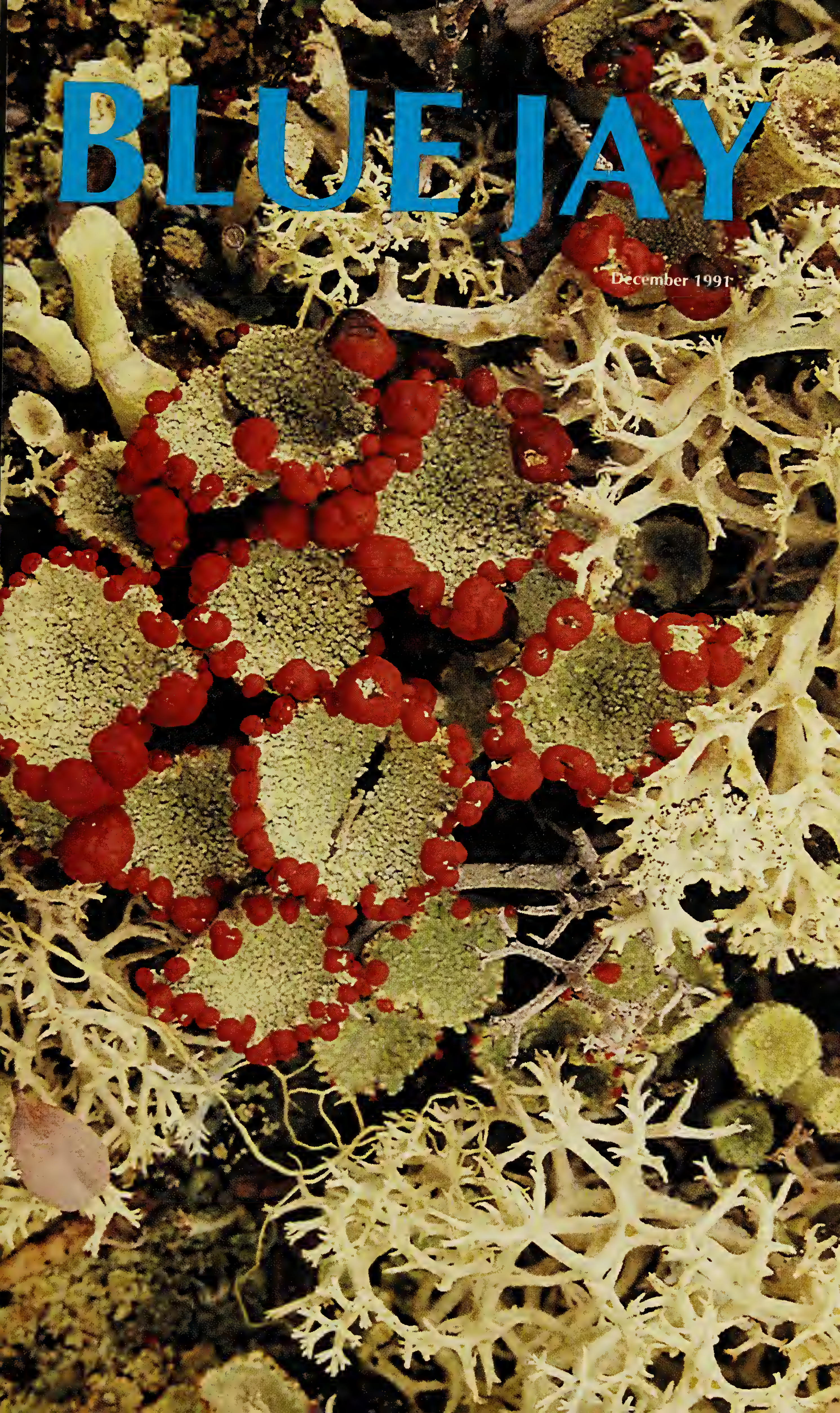
University of Alberta Library
0 1620 1670 0856



BLUE JAY

December 1991



Blue Jay, founded in 1942 by Isabel M. Priestly, is a journal of natural history and conservation for Saskatchewan and adjacent regions. It is published quarterly by the **Saskatchewan Natural History Society, Box 4348, Regina, Saskatchewan, S4P 3W6.**

CN ISSN 0006-5099.

Editor: J. Lynn Brown

Associate Editors: Margaret Belcher, J. Bernard Gollop, Wayne C. Harris, Ronald Hooper, John H. Hudson, Bruce A. McCorquodale, Robert W. Nero, Carol A. Scott

Editorial Assistant: Carman Dodge

EDITORIAL INFORMATION: All items for publication should be addressed to the editor, care of SNHS (see address at top). Deadlines for each issue are two months prior to issue, i.e. 1 January, 1 April, 1 July, and 1 October. Please include author's telephone number for editorial contact, if necessary. Typewritten manuscripts should be double spaced and submitted in duplicate. Manuscripts may be submitted in text file form on IBM 5.25 inch DSDD diskettes, which will be returned to authors when copies have been made. The editor uses Word Perfect 5.1 and can accept manuscripts in ASCII format also. Please include a hard copy. For further guidelines, contact the editor.

Common names are used for species where possible. Bird names follow the 1983 revision of the *American Ornithologists' Union Check-list.* Mammals are from Banfield's *The Mammals of Canada* (1974). Since insect and plant names are not standardized, scientific names are included, with authorities where deemed necessary.

Photographs submitted should be on glossy paper. Negatives or slides sent will be returned after prints have been made for SNHS files. Prints will be returned on request. Deadlines for photographic materials are one month prior to issue, i.e. 1 February, 1 May, 1 August, and 1 November.

Any material printed for the *Blue Jay* may be reproduced without permission. Credit lines are appreciated. Use of photographs requires written permission from the photographer.

ADVERTISING: Advertising rates may be obtained from SNHS (address at top).

REPRINTS: Requests for quantities of reprints of any article in **Blue Jay** should be made to the editor with the submission of an article. Contributors wishing a few extra copies of the current issue may get them at cost. Requests for these should be made to the editor when the material is submitted for publication.

SUBSCRIPTION: Send all renewals, new memberships and correspondence concerning changes of address to SNHS (address at top).

The classes of membership in the Society are as follows: Individual (over 17) $15; Family $20; Sustaining $30; Patron $60; Life $600; Youth (under 18) $8; and Senior (over 64) $13. Sustaining and Patron memberships include the regular fee plus a donation for which a receipt is available upon request, for income tax purposes. Bulk orders (minimum of five copies to one address) are available to club members and educational institutions at the rate of $15 for the first subscription and $13 for each additional one. Outside Canada, fees are $18. We do not collect GST on memberships.

Cover: Red Apothelia, *Cladonia coccifera* (L.) Willd., nestled in Reindeer Lichen, *Cladina mitis* (Sandst.) Hustich, Little Gull Lake. Photo: George Tosh.

Published by the Canadian Plains Research Center, University of Regina. Printed by Merit Printing, Regina, Saskatchewan.

THIS ORGANIZATION RECEIVES FUNDING FROM

Saskatchewan
LOTTERIES
LOTTERY TICKET CENTRE

Blue Jay

Vol. 49 No. 4 December 1991 161-242

Photo Essay

THE GLORY OF THE ATHABASCA SAND DUNES.
Photos by Frank Roy, Ken Coutu, and George Tosh 164

Palaentology

FOSSIL CROCODILE DISCOVERED ALONG THE CARROT RIVER.
Tim T. Tokaryk 171

Insects

AN AMATEUR NATURALIST'S GUIDE TO NON-BITING MIDGES IN SASKATCHEWAN.
P. G. Mason, D. W. Parker and P. Morrill 174

ALBERTA SWALLOWTAILS AND PARNASSIANS: NATURAL HISTORY, KEYS, AND DISTRIBUTION.
Felix A. H. Sperling and Norbert G. Kondla 183

Birds

UNUSUAL BARN SWALLOW NEST SITE.
Dale Hjertaas 193

NESTING SWALLOWS ON THE GO.
Donald F. Hooper and Frank Switzer 194

CLARK'S GREBES AND SUSPECTED WESTERN X CLARK'S GREBE HYBRIDS IN MANITOBA.
Bruce A. Eichhorst and Barry D. Parkin 196

SAP FOR SURVIVAL.
Donald F. Hooper 201

ADDITIONS TO THE MANITOBA BIRD LIST (1985-1990).
Rudolph F. Koes 202

GREAT GRAY OWL AND NORTHERN HAWK OWL NESTS AT CHURCHILL, MANITOBA.
Anthony L. Lang, James R. Duncan, Scott Ramsay, and James D. Rising 208

Mammals

ELK CALF "HIDES" UNDERWATER.
William J. Walley 215

Nature Library

BIRDER'S GUIDE TO SOUTHWESTERN MANITOBA.
Reviewed by *Bernie Gollop* 217

WITH PTARMIGAN AND TUNDRA WOLVES.
Reviewed by *Jim Jowsey* 218

Letters

BLACK SWALLOWTAIL. *Marie Peronne* 192

Conservation

ON SITE EDUCATION: A FIRST STEP TO IMPROVED PROTECTION OF ENDANGERED SPACES.
Peter Jonker 220

Society News 224

Index to Volume 49, 1991 229

Editorial 163

Black-billed Magpie. *Lorne Scott*

Editorial

The main feature of this issue is the photo essay of the Athabasca Sand Dunes. George Tosh, Frank Roy, Ken Coutu and Dennis Tyson (see below) went to the dunes in the summer of 1990 to photograph, for perpetuity, the uniqueness of the area. The foursome developed a show of slides taken during their trip.

Frank Roy maintains that there are four main reasons to preserve the dunes: their immensity, their fragility, the spectacular braided river, and the endemic plants. The dunes are the largest in Canada. The wind from the northwest is almost ceaseless, pushing the sand relentlessly to the southeast. The area is also very fragile. Plant roots have only a tenuous grasp on the soil; any disruption can leave the sand below open to the wind's devastation.

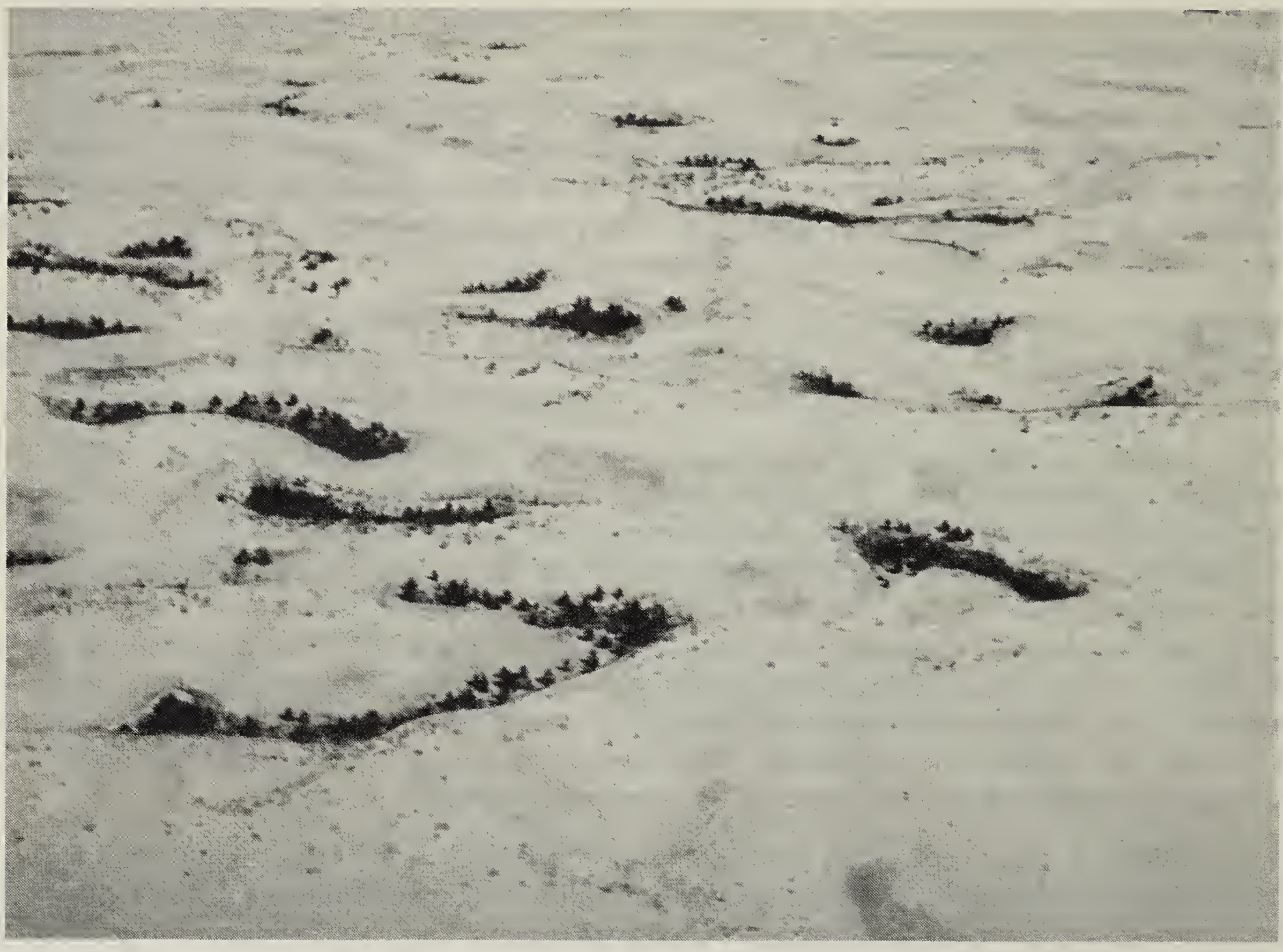
The William is a braided river. Much as the wind forms the dunes above, the running water carries and shapes the sand below the surface into bars, giving the river an appearance much like braided hair. Frank says that anyone who has seen the river will never forget it.

Frank provided a list of the nine species and one variety of plants that are known to be unique to the Athabasca dunes. These include four willows, five flowering plants and one type of grass. The endemic willows are: Felt-leaved Willow (*Salix silicicola* Raup), Turnor's Willow (*Salix turnorii* Raup), Tyrrell's Willow (*Salix tyrrelli* Raup) and Short-fruited Sand Willow (*Salix brachycarpa*, var. *psammophila* Raup). The five flowering plants are: Large-headed Wooly Yarrow (*Achillea megacephala* Raup), Inland Sea Thrift (*Armeria maritima* ssp. *interior* Raup), Sand Chickweed (*Stellaria arenicola* Raup), Impoverished Pineweed (*Lechea intermedia* var. *depauperata* Hodgdon) and Lake Huron Tansy var. floccosum (*Tanacetum huronense* var. *floccosum* Raup). The latter is a variety found only in the dunes area. The last endemic is Mackenzie Hair-grass (*Deschampsia mackenzieana* Raup).

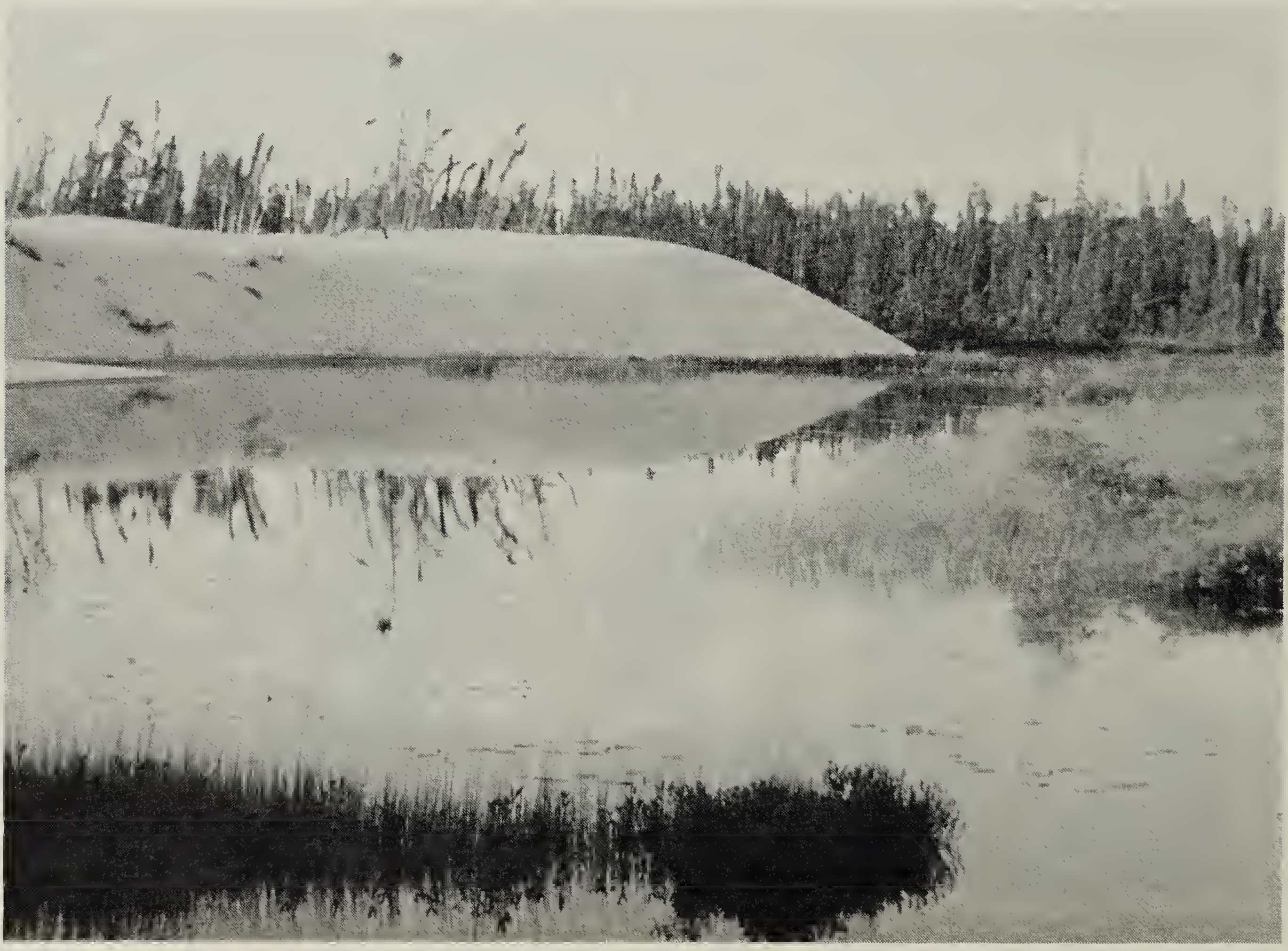
I would like to thank Frank, Ken and George for allowing their slides to be used for the photo essay. Frank was very helpful in describing the ecology of the dunes. Professor John W. Sheard at the University of Saskatchewan, who I am told can identify a lichen at 100 feet, kindly identified the lichens on the cover.

Members of the party to the Athabasca Sand Dunes: (l. to r.) Ken Coutu, Frank Roy, George Tosh, and Dennis Tyson. *Margaret Tosh*

THE GLORY OF THE ATHABASCA SAND DUNES
A Photo Essay



An aerial view of the dunes east of the William River. The Athabasca Sand Dunes are the largest in Canada. *Frank Roy*



Slow-moving sand begins to overtake muskeg and forest, Little Gull Lake. *Frank Roy*

Desert sands and water, side by side. *Frank Roy*

Most of its roots exposed, a pine clings desperately to life above the William River. *Frank Roy*

The abundance of cones on a black spruce, its last stand against the oncoming sand. Cones that outlast the shifting dunes may produce a new forest.

Frank Roy

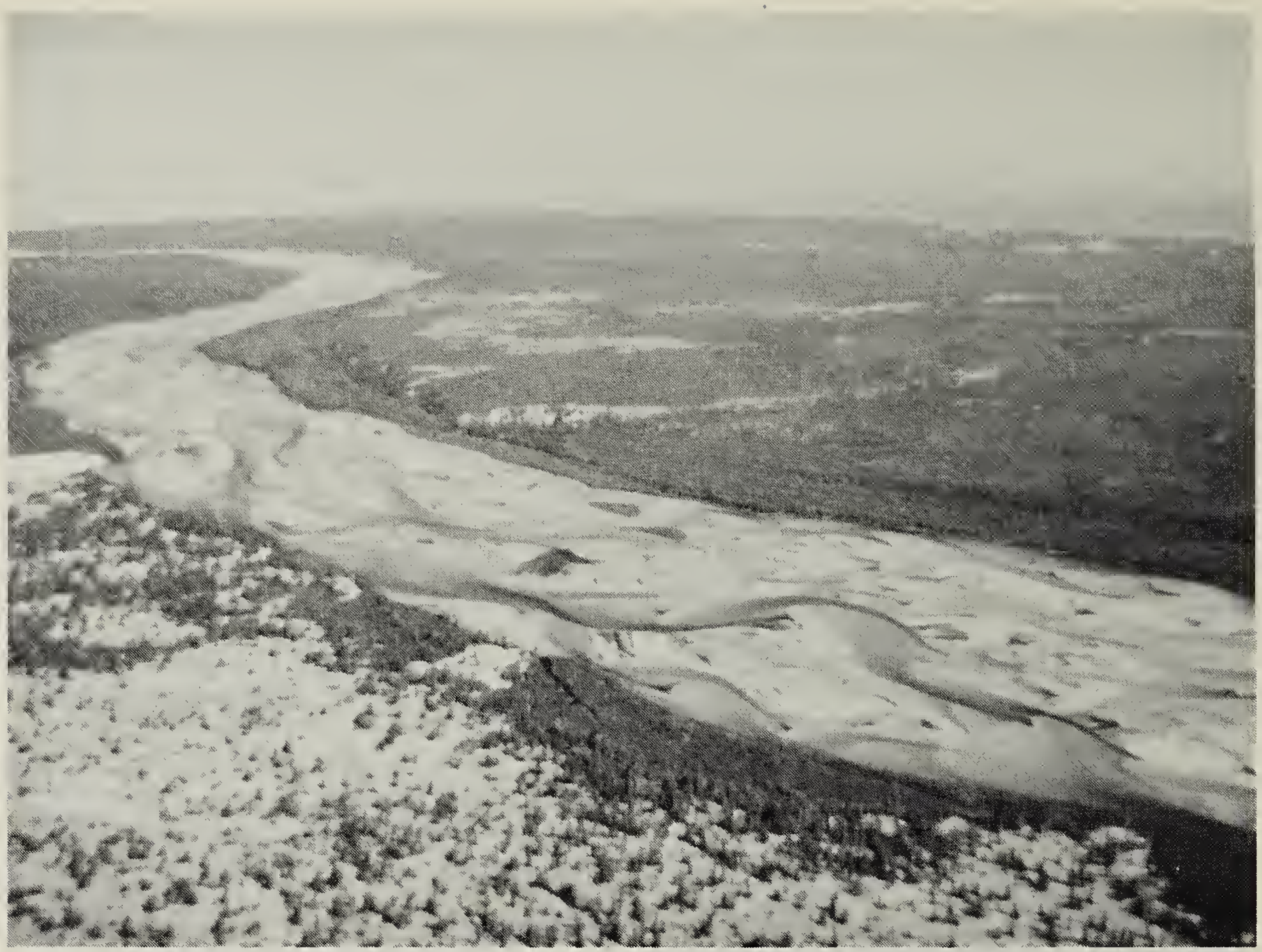
The sands move on, now uncovering trees once covered.

Frank Roy

Dennis Tyson and George Tosh look west to the William River Dunes, the largest dune field on the south shore of Lake Athabasca.

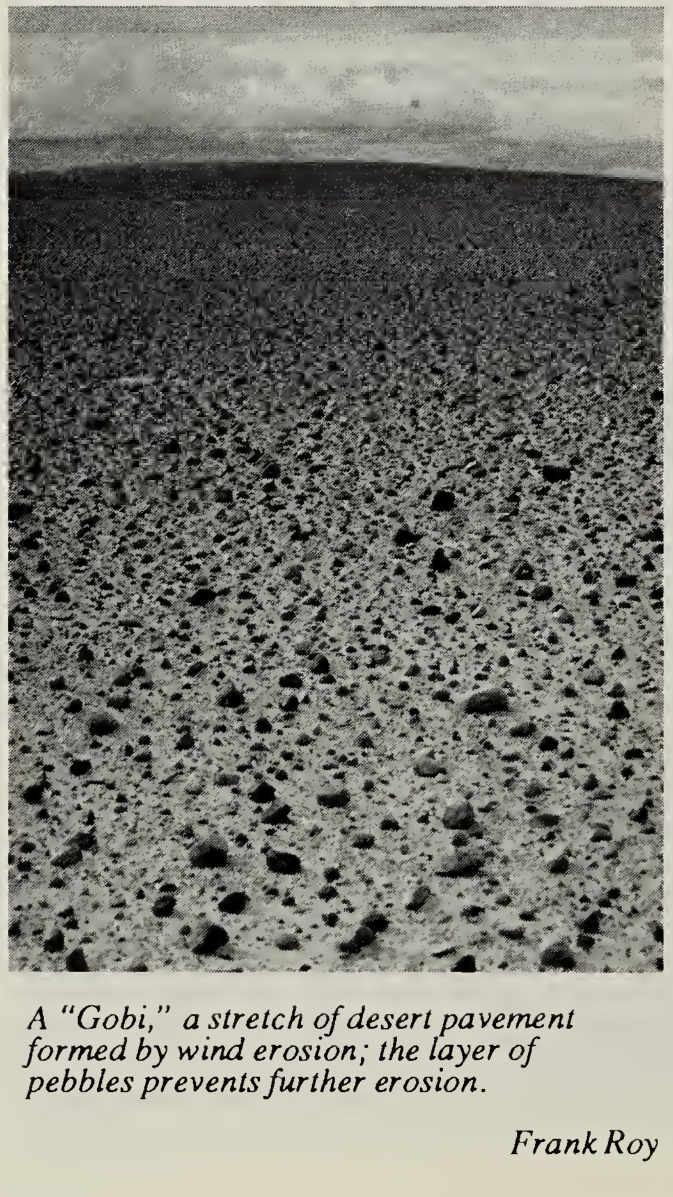
Frank Roy

Dunes here rise 50 m above the William River. *Frank Roy*



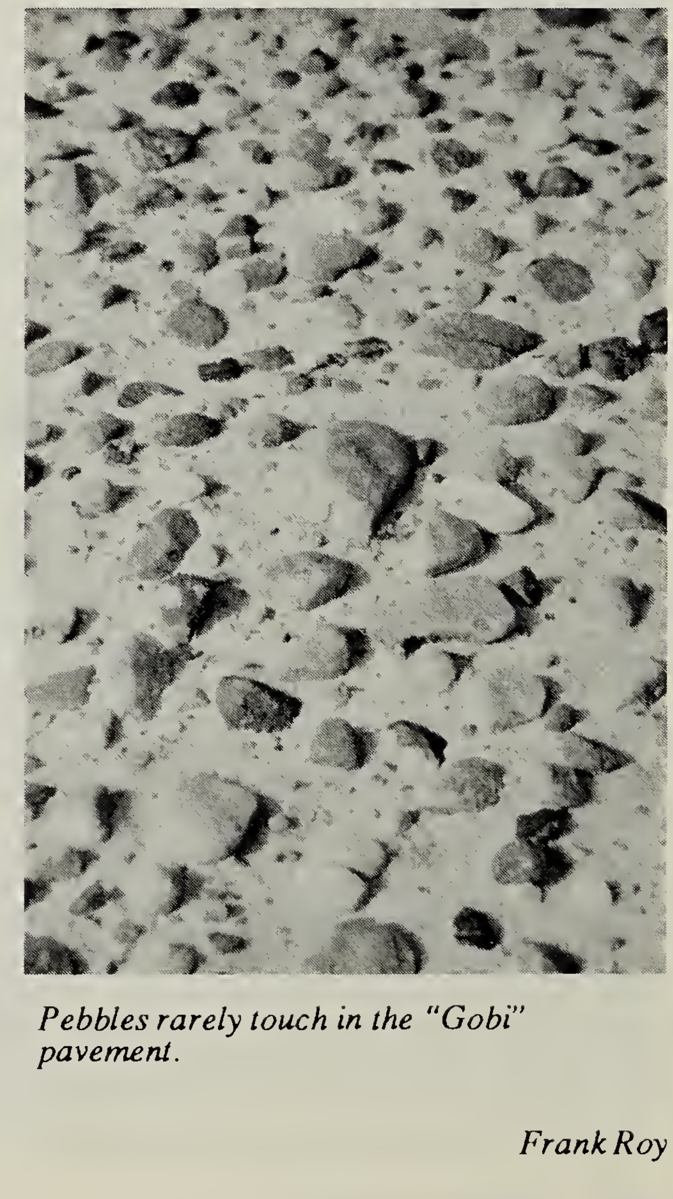
As it nears its mouth, the William broadens to become a braided river: a criss-crossing of shallow streams and sand, deep orange, pink, cinnamon and yellow, "like dunes below the surface."

George Tosh



A "Gobi," a stretch of desert pavement formed by wind erosion; the layer of pebbles prevents further erosion.

Frank Roy



Pebbles rarely touch in the "Gobi" pavement.

Frank Roy

An endemic variety, the Lake Huron Tansy, is a common, sturdy plant with gray-green leaves that help stabilize the dunes wherever it grows.

Ken Coutu

Turnor's Willow: first noted in 1936 by Raup, the botanist who discovered the endemics of the dunes. The bark on mature specimens is as white as that of a birch.

George Tosh

The Felt-leaved Willow, the most impressive of the willow endemics has thick gray-green leaves, typical of plants that adapt to desert-like conditions.

Frank Roy

Like a cluster of African village huts, these tiny mushrooms, less than 1 cm across, grow in moist depressions in the sand.

Ken Coutu

Horsehead landmark, Little Gull Lake. *Frank Roy*

FOSSIL CROCODILE DISCOVERED ALONG THE CARROT RIVER

TIM T. TOKARYK, Saskatchewan Museum of Natural History, 2340 Albert Street,
Regina, Saskatchewan. S4P 3V7

In September 1991, Dr. Steve Cumbaa of the Canadian Museum of Nature in Ottawa and I began prospecting for fossils along the Carrot River, northeast of Melfort, Saskatchewan. Our intentions were to explore known localities as well as virgin territory. Dr. Cumbaa is interested in fossil fish so we paid close attention to the shale surfaces that contained these fossils. Upon visiting a site first discovered by museum staff in 1959, we found large bones high up on the vertical face of the riverbank. Our immediate plans did not include major excavation so it was decided to continue prospecting and hope that I could return soon to collect whatever was still encased in the rock.

The fossils were precariously perched on the edge of the riverbank, five metres above the river. Because spring runoff increased the volume of water in the river considerably, there was serious concern that undercutting and general erosion could destroy the bones by the next year. We had to get the skeleton out soon. Thanks to the Saskatchewan

The cutbank of the Carrot River. Tent encloses the specimen. *Tim Tokaryk*

The skull, turned upside down, in the rock. This picture shows the "Y-shaped" lower jaw. *Tim Tokaryk*

Natural History Society, the Saskatchewan Museum of Natural History (SMNH) and the Museum of Natural History associates, we were able to recover the endangered bones, and make a surprising discovery at the same time.

The Excavation

The excavation took eight days and involved three people, Frank McDougall, Doug Taylor and myself. We were prepared for bad weather, bringing a large floorless cook tent to cover a portion of the quarry. This came in handy on the second day when it snowed continuously. The snow also presented problems in getting to the quarry via grid roads and small trails, and made exposing the bone very difficult. Though the tent protected us somewhat from the cool wind and snow, the glue we were using would not harden at low temperatures. Our problem was solved when two propane heaters were sent up from Regina.

Our prime objective was to remove the bones near the edge of the cliff and collect anything else we could remove in the time that we had. We had to remove a couple of tonnes of shale which covered the find. This part of the job was slow because we had to examine every major piece of shale carefully, to collect other fossils that are abundant in the deposit. The method of splitting shale, examining, then either tossing or keeping blocks, turned up several shark teeth, a scattering of fish parts and two articulated fish skeletons.

The main specimen we were going to such lengths to collect was a partial, articulated skeleton. By the time we finished, our bone count was over 75 with more going into the hill. The largest bone was the skull, at 1.3 m. After plastering, the block with the skull weighed over 160 kg, and we had to face the problem of removing it. This was resolved by borrowing a four-wheel-drive all-terrain vehicle and a sled. After eight days we had collected over 100 bones and teeth from the quarry site.

I Am Not Sherlock Holmes

Now I come to the detective work done at the site and back in the laboratory of the SMNH. It was my impression that the animal entombed in the black-grey shale was a marine reptile called a plesiosaur. There are two groups of these animals, the short-necked and long-necked, but generally these fisheaters had proportionally small heads, long necks, rotund bodies, large flippers and small tails. One kind of evidence I used in making my identification was that the only other large marine reptile known to have existed at this time, the mosasaurs, have vertebra centra that are convex/concave at the posterior and anterior ends. The Carrot River specimen has vertebra centra that are slightly concave/concave which are normally associated with plesiosaurs. Halfway through the excavation we found the skull with lower jaws attached; it was turned upside down. Though massive, the "Y-shaped" lower jaw could possibly have belonged to the short-necked variety of plesiosaurs. Later we discovered the forelimb of an animal that was neither plesiosaur or mosasaur but had the general appearance of a land animal's leg. My imagination ran from the large, toothed birds to dinosaurs.

After our return to Regina, I began preparation of the limb, which turned out to be nearly complete from the shoulder girdle (scapula/coracoid) down to its finger bones (phalanges). The next stage of preparation began - the skull. The first area to be worked on was near the end of the snout where a large hole (external nares) was soon uncovered. Only one group of animals – crocodiles – has this feature. After this it was easy to put one and one together. What we thought were two animals, the plesiosaur and whatever, were in fact one large crocodile. [I am reminded of a quote from "The Adventures of Black Peter," a Sherlock Holmes tale: "We all learn by experience and your lesson this time is that you should never lose sight of the alternative."]

85 Million Years Ago

This crocodile lived 85 million years ago when portions of the interior of North America were under water, in what was called the Western Interior Seaway. We are certain of the aquatic nature of these sediments and this skeleton by the variety of fish and shark remains and by the fact that this particular group of crocodile is found only in marine sediments. We are also fairly confident in our estimation of the age through relative dating. This age determination will be further strengthened by radiometrical dating of the bentonite (volcanic ash) layers overlying the skeleton.

The skeleton, by rough comparisons with similar types found elsewhere, would have been about seven m long. The crocodile probably fed on fish.

Crocodile records from marine rocks of North America during the Late Cretaceous Period are extremely rare. The group that I think this specimen belongs to, the sub-order Mesosuchia, family Pholidosauridae, is represented by only four or five specimens.

The Future

We left the site knowing that there are more bones in the hill. Whether we have a complete skeleton or not will not be known until next year when we return. There are many questions about life 85 million years ago in an area we now call the Carrot River, and with further study and collecting we may just be able to answer a few of them.

AN AMATEUR NATURALIST'S GUIDE TO NON-BITING MIDGES IN SASKATCHEWAN

P. G. MASON, Agriculture Canada, Research Station, 107 Science Place, Saskatoon, Saskatchewan. S7N 0X2; D. W. PARKER and P. MORRILL, Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan. S7N 0W0

Non-biting midges (chironomids) belong to the insect order Diptera (true flies). Their life cycle consists of four stages: egg, larva, pupa and adult.

The larvae and pupae of chironomids inhabit almost every aquatic habitat in the world. Some species can withstand temperatures in excess of 50°C in Australian rockpools, while others inhabit glacial meltwaters at 0.5°C.[18,19] In Canada, chironomids have been found living in petroleum pools and one species, *Cricotopus ornatus* Meigen, occurs abundantly in Waldsea Lake, Saskatchewan, where salinity exceeds 200,000 ppm (ten times the salinity of ocean water).[38,42] Many species, particularly in the genera *Chironomus* and *Cryptochironomus*, have a characteristic red colour because their blood (hemolymph) contains the oxygen carrying pigment haemoglobin. These so-called "blood worms" live in the mud where oxygen levels are very low, such as at the bottom of Waskesiu Lake.[36]

Some chironomid species form close relationships with other organisms. For example, certain species of *Cricotopus* live within colonies of the blue-green alga *Nostoc*.[6] Species of the genus *Metriocnemus* live in pitcher plants.[34] Many other species exhibit phoresy, a type of relationship in which one organism is carried on the body of a larger organism but does not feed on the latter, or parasitize other invertebrates, including other aquatic insects and molluscs.[14,15,41]

Chironomid larvae form an important part of many aquatic ecosystems. In Tobin Lake and nearby parts of the Saskatchewan River, two-thirds of the aquatic insect species are chironomids.[27] Chironomids also form the bulk of the aquatic insect species in marshes and ponds.[17,50] Larvae in some nutrient-rich habitats occur in densities of more than 100,000/m^2.[20]

The larvae of most species feed on algae and decaying plant material and therefore provide primary links in aquatic food webs. They are also important indicators of pollution at sublethal and lethal levels.[29,45,46]

Chironomids are economically important in many parts of the world. Larvae of one semi-terrestrial species, *Bryophaenocladius furcatus* (Kieffer) are known to cause damage to seedling tomato and lettuce crops in England.[9] In certain parts of Florida and California, large emergences of adult chironomids cause reduced use of recreational areas.[2,7,22] In many areas people suffer from allergenic responses to either body hairs or haemoglobin of chironomid adults.[10] In Saskatchewan, summer mass emergences of adult *Chironomus plumosus* (Linnaeus) at Tobin Lake have resulted in many complaints by local residents.

The objectives of this article are to provide the reader with some background information on these ecologically important insects and to list the species which have been recorded in Saskatchewan.

Life History

During the spring or summer the female deposits a mass of eggs embedded in a gelatinous matrix. When the egg matrix comes in contact with water, it expands and floats on the surface until it contacts a rock, vegetation or other solid surface, to which it adheres. The duration of the egg stage depends on the temperature.[31]

The larval stage is the longest of the life cycle and is essentially the only feeding stage. The larva sheds its skin (moults) four times. The first instar larva (the larva from the time of hatching until the first moult) is free-swimming which is important for dispersal in lakes and ponds.[12] In rivers and streams, dispersal is accomplished by drifting with the current or by upstream movement by the larvae.[13] First instar larvae obtain nourishment from the remaining yolk and by feeding on suspended particles in the water.[1,30]

When a suitable microhabitat is found, the larvae establish either a sedentary or free-living mode of life, which continues throughout the rest of larval development. Many sedentary species construct cases composed of particles of silt or sand cemented together with silk-like secretions from their salivary glands. Some species attach their cases to plants or animals while others make burrows a few centimetres into the substrate. Free-living larvae move over the bottom and skim plants in search of food. Many larvae feed be scraping algae, bacteria and organic debris from rocks or wood, or by engulfing quantities of sediment.[44,51] The larvae of other species construct a net of silk-like salivary strands over the opening of their larval case or burrow and filter particles such as bacteria, detritus and algae from the water.

Species of the subfamily Tanypodinae and a few species from other subfamilies are predators.[3] The mouthparts of these larvae are modified to grasp prey. Small prey are engulfed whole; larger prey are held while the body fluids are sucked out.[28] A few species are parasitic on larger aquatic insects and molluscs.[41]

The length of time required to complete the life cycle depends on environmental conditions, especially temperature.[30] In warm regions, life cycles can be as short as two weeks.[43] In temperate regions, such as Saskatchewan, there are usually only one or two generations per year because development is interrupted during winter.[31] In these regions the larvae are the usual overwintering stage.[11]

Just before pupation the anterior part of the larva becomes enlarged and the adult leg, wing and antennae can be observed through the sheath during this stage. Pupation of burrow-dwelling chironomids usually occurs within the burrow. In free-living species the pupa is also free-living. The pupal stage typically lasts two to three days.[5,31]

When mature, the pupa rises to the water surface; the skin, which is also an exoskeleton, splits lengthwise long the upper surface of the thorax; the adult emerges through this split. The adult is able to fly almost immediately. The adult stage may last for several weeks; its primary functions are dispersal and reproduction. The adults have reduced mouth parts and most do not feed, although adult females of some species imbibe nectar.[16]

Most chironomid species form mating swarms comprised of adult males.[21] On a warm, calm summer evening, chironomid swarms commonly appear just before sunset at the edge of lakes.

The mass of hundreds of individuals gently moves up and down, similar to smoke rising from a smokestack. The swarms occur over a marker, such as a post or rock. Females are attracted to the swarm and fly into it in search of a mate. Mating can take place in midair or the pair may fly to the ground. Male chironomids identified by their long, plumose (feathery) antennae are attracted to the sound of females in flight.[35]

After mating the females fly to oviposition sites where the egg masses are laid on the water surface at dawn or dusk. Adults may live for up to two weeks and the females of some species lay two egg masses. A few species can lay eggs without mating.[30]

Collection and Preservation of Specimens

Egg masses may be collected from floating sticks or vegetation. A trap can be made by passing a string through a series of corks, arranged perpendicular to the prevailing winds or current to collect floating egg masses.

Larval and pupal specimens can be collected by several methods. A simple method involves scooping substrate from the bottom of a water body with a net or kitchen screen and washing the contents using a sweeping motion to remove fine silt particles from the sample. The contents are placed in a white pan partially filled with water. Live specimens are removed with a wire loop, dropper or forceps and either placed in jars for transport to the laboratory for rearing or preserved in 80% alcohol.

Larvae of some species are found in specialized habitats such as rotting wood, sponges, plant material or on rocks. These can be searched individually for larvae and pupae.

Pupal skins, which are shed when the adults emerge, can be collected using a fine mesh net. In running water, the net is held in the current for a few minutes with half the opening below the water surface; in lakes or ponds the net is skimmed over the surface. The accumulated individuals are washed to the bottom of the net and the contents placed in a jar containing 80% alcohol. Foam along the shore of streams, lakes or ponds can also yield specimens.

Dusk is a particularly good time to collect adult specimens using an aerial sweep net. Males are attracted also to lights at night. Specimens are aspirated into a vial and preserved in 70% alcohol.

A label with the location, habitat type, approximate water depth, date and name of the collector should be placed on each sample. Labels should always be written in pencil.

Rearing

For many species of chironomids the larval, pupal and adult stages are known independently of each other and have yet to be associated. Rearing larvae to the adult stage is the best means to fill this important gap in our knowledge. Larvae can be reared with little or no specialized equipment. Prepupal individuals, identified by the enlarged area just behind the head, are placed in small vials half full of dechlorinated water (this is done using an aquarium dechlorinator or by letting the water stand for 24 h). The vials are placed in a tray of water out of direct sunlight. Tap water (15°C) can then be circulated through the tray using rubber hoses to keep the larvae cool if temperatures get much above 22°C. Vials should be checked daily and emerged adults placed in dry vials in a cold (5°C) refrigerator for 24 h. This hardens the cuticle and ensures that the wings are completely expanded and cleared, which is essential for identification. The adult is then preserved along with the associated larval and pupal exuviae in 70% alcohol.

Preparation of Study Material

Identification to species or genus requires examination under a microscope. The preparation of specimens for microscopic analysis involves a number of chemicals and equipment not readily available to most naturalists. Interested individuals should refer to Mason, Pinder or Parker for a full account of the procedures used.[23,33,35]

Species List

The chironomid fauna of Saskatchewan is not very well known. To date, only parts of the Saskatchewan River, Waskesiu and Waldsea Lakes, and ponds in the vicinity of Saskatoon have been studied. Four new species have been described and several other new species have yet to be described from material collected at these sites.[25] The chironomid fauna of the lakes and streams in and around Lake Athabasca, the boreal forest, Grasslands National Park and the Cypress Hills have yet to be studied. When these areas are studied many species not yet recorded for the province and even new species will likely become known. A list of chironomid species known to occur in Saskatchewan is presented in Table 1 (see end of article). The list is a summary of various works containing new records and significant range extensions for some species.[17,23,24,29,33,50]

Taxonomic Information

Lists of described genera and North American species are available.[4,9] Larval keys to genus are presented by Coffman and Ferrington, Oliver and Roussel and Wiederholm.[8,32,47] Pupal keys for genera are found in Coffman and Ferrington and Wiederholm.[8,48] Keys to genera for adult males are found in Oliver and Wiederholm and to adult females in Saether.[31,39,49] Saether provided a glossary for the structural terms of all chironomid stages.[40]

Species keys for known Saskatchewan River chironomids were written by Mason and for pond chironomids by Parker.[23,24,33] Another useful key is Roback for adult male Tanypodinae.[37]

An analysis of the origin and distribution of Saskatchewan River chironomids is found in Mason and Lehmkuhl.[26]

Areas for Further Research

This group of insects provides a good opportunity for naturalists to contribute valuable scientific information. For example, a great deal of work is needed in associating larval, pupal and adult stages. Basic survey work is also needed in many parts of the province. Times of emergences are unknown for many species.

References

1. ALEKSEYEV, N.K. 1965. Plankton feeding of Chironomidae during the larval stage. Nauchnye Poklady U Ysshei Shkoly, *Bioligichiskie Nauki* 1:19-21.

2. ALI, A. 1981. Laboratory evaluation of organophosphates and new synthetic pyrethroid insecticides against pestiferous chironomid midges of central Florida. *Mosquito News* 42:157-161.

3. ARMITAGE, P.D. 1968. Some notes on the food of chironomid larvae of a shallow woodland lake in south Finland. *Annales Zoologische Fennici* 5:6-13.

4. ASHE, P. 1983. A catalogue of chironomid genera and subgenera of the world including synonyms (Diptera: Chironomidae). *Entomologica Scandinavica*, Supplement 20:1-68.

5. BEATTIE, D.M. 1978. Life cycle and changes in carbohydrate, proteins and lipids of *Pentapedilum incinatum* Goet. (Diptera: Chironomidae). *Freshwater Biology* 8:109-113.

6. BROCK, E.M. 1960. Mutualism between the midge *Cricotopus* and the alga *Nostoc*. *Ecology* 41:474-483.

7. BURRILL. A.C. 1913. Economic and biological notes on the giant midge *Chironomus* (*Tendipes*) *plumosus* Meigen. *Bulletin of the Wisconsin Nat. Hist. Soc.* 10:124-163.

8. COFFMAN, W.P. and L.C. FERRINGTON. 1984. Chapter 25. Chironomidae. Pp. 551-562 *in* Merritt,

R.W. and K. W. Cummins (editors), Aquatic Insects of North America. Kendall Hunt, Dubuque, Iowa. 722 pp.

9. CRANSTON, P. S. 1987. A non-biting midge (Diptera: Chironomidae) of horticultural significance. *Bull. of Ent. Res.* 77:661-667.

10. CRANSTON, P.S., M.O. GAD, E. RAB and A.B. KAY. 1981. Chironomid midges as a cause of allergy in the Sudan. *Transactions of the Royal Soc. of Tropical Medicine and Hygiene* 75:1-4.

11. DANKS, H.V. 1971 a. Overwintering of some north temperate and arctic Chironomidae. *Can. Entomol.* 103:589-604.

12. ——. 1971 b. Life history and biology of *Einfeldia synchrona* (Diptera: Chironomidae). *Can. Entomol.* 103:1579-1606.

13. DAVIES, B.R. 1976. The dispersal of Chironomidae larvae: a review. *J. of the Entol. Soc. of South Africa* 39:39-62.

14. DOSDALL, L.M. and P.G. MASON. 1981. A chironomid (Nanocladius (Plecoptera- coluthus) branchicolus: Diptera) phoretic on a stonefly (*Acroneuria lycorius*: Plecoptera) in Saskatchewan. *Can. Entomol.* 113: 141-147.

15. DOSDALL, L.M., P.G. MASON and D.M. LEHKUHL. 1986. First records of phoretic Chironomidae (Diptera) associated with nymphs of *Pteronarcys dorsata* (Say) (Plectoptera: Pteronarcyidae). *Can. Entomol.* 118:511-515.

16. DOWNES, J.A. 1974. The feeding habits of adult Chironomidae. *Entomologia Tidskrift*, Supplement 95:84-90.

17. DRIVER, E.A. 1977. Chironomid communities in small prairie ponds: some characteristics and controls. *Freshwater Biology* 7:121-134.

18. DUMBLETON. L.J. 1973. An ice chironomid. *New Zealand Ent.* 5:131-133.

19. EDWARD, D.H. 1968. Chironomidae in temporary freshwater. Australian Society of Limnology 6:3-5.

20. FAGAN, C.B. and W.R. ENNS. 1966. The distribution and biology of aquatic midges in Missouri lagoons. Proc. of the Entomol. Soc. of Washington 68:277-289.

21. GIBSON, N.E.H. and L. LLOYD. 1945. On mating swarms of certain Chironomidae (Diptera). Transactions of the Royal Entomol. Soc. of London 95 (Part 6): 263-294.

22. JOHNSON, G.D. and M.S. MULLA. 1982. An aquatic macrophyte affecting nuisance chironomid midges in a warm water lake. *Environmental Ent.* 12:266-269.

23. MASON, P.G. 1978. A biosystematic study of larval and pupal Chironomini (Diptera: Chironomidae) from the North and South Saskatchewan Rivers. M. Sc. Thesis, University of Saskatchewan. Saskatoon. 456 pp.

24. ——. 1983. Systematics and ecology of Chironomidae (Diptera) associated with Tobin Lake reservoir and the Saskatchewan River. Ph. D. Thesis, University of Saskatchewan, Saskatoon. 771 pp.

25. ——. 1986. Four new species of the Crytochironomus fulvus (Johannsen) species complex (Diptera: Chironomidae). *Entomoligicae Scandinavica* 16:399-413.

26. MASON, P.G. and D.M. LEHMKUHL. 1983. Effects of the Squaw Rapids hydroelectric development on Saskatchewan River Chironomidae (Diptera). *Memoirs of the Amer. Entomol. Soc.* 34:187-210.

27. ——. 1985. Origin and distribution of the Chironomidae (Diptera) from the Saskatchewan River, Saskatchewan, Canada. *Can. J. of Zool.* 63:876-882.

28. MORGAN, M.J. 1949. The metamorphosis and ecology of some aspects of Tanypodinae (Diptera: Chironomidae). *Entomol. Monthly Magazine* 85:119-126.

29. MORRILL, P.K. 1988. Disturbance of pond Chironomidae communities by deltamethrin insecticide. M. Sc. Thesis, University of Saskatchewan, Saskatoon. 126 pp.

30. OLIVER, D.R. 1971. life history of the chironomidae. *Ann. Review of Ent.* 16:211-230.

31. ——. 1981. Chapter 29. Chironomidae. Pp. 423-458 *in* McAlpine, J.F., B.V. Peterson, G.E. Shewell. H.J. Teskey, J.R. Vockeroth and D.M. Wood, (editors). Manual of Nearctic Diptera Vol. 1. Research Branch, Agriculture Canada. Monograph No. 27, 674 pp.

32. OLIVER , D.R. and M.E. ROUSSEL. 1983. The genera of larval midges of Canada (Diptera: Chironomidae). The Insect and Arachnids of Canada. Part II. Ag. Can. Publ. 1746, 263 pp.

33.

PARKER, D.W. 1985. Biosystematics of Chironomidae inhabiting selected prairie ponds in Saskatchewan. M. Sc. Thesis, University of Saskatchewan, Saskatoon. 258 pp.

34. PATERSON, C.G. and C.J. CAMERON. 1982. Seasonal dynamics and ecological strategies of the pitcher plant chironomids *Metriconemus nabi* Coq. (Diptera: Chironomidae) in southwestern New Brunswick. *Can. J. of Zool.* 60:3075-3083.

35. PINDER, L.C.V. 1989. 1. The adult males of Chironomidae (Diptera) of the Holarctic region. Introduction, in Wiederholm, T. (editor), The adult males of Chironomidae (Diptera) of the Holarctic region ! keys and diagnoses. *Entomologica Scandinavica*, Supplement 34:5-10.

36. REMPEL, J.G. 1936. The life history and morphology of *Chironomus hyperboreus*. *J. of the Biological Board of Canada.* 2:209-221.

37. ROBACK, S.S. 1971. The subfamily Tanypodinae in North America. Monographs of the Academy of Natural Science, Philadelphia. No. 17, 410 pp.

38. ROSENBERG, D.M. and A.P. WIENS. 1976. Community and species responses of Chironomidae (Diptera) to contamination of fresh waters by crude oil and petroleum products with special reference to the Trail River, North West Territories. *J. of the Fisheries Res. Board of Canada.* 33:1955-1963.

39. SAETHER, O.A. 1977. Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. Bull. of the Fisheries Res. Board of Canada 197, 209 pp.

40. ——. 1980. A glossary of terminology of Chironomidae. *Entomologica Scandinavica*. Supplement. 14, 50 pp.

41. STEFFAN, A.W. 1965. On the epizoic associations of Chironomidae (Diptera) and their phyletic relationships. Pp. 77-78 in Proc. of the 12th International Congress of Ent., London 1964.

42. SWANSON, S.M. 1978. Ecology and production of macrobenthos in Waldsea Lake, Saskatchewan, with emphasis on *Cricotopus ornatus* (Diptera: Chironomidae). M. Sc. Thesis, University of Saskatchewan, Saskatoon. 238 pp.

43. SYRJAMAKI, J. 1965. Laboratory studies on the swarming behaviour of *Chironomus strenzki* Fittkau in litt. (Diptera, Chironomidae). I. Mechanisms of swarming and mating. *Annales zoologici fennici* 4:19-28.

44. WALSHE, B.M. 1951. The feeding habits of certain chironomid larvae (subfamily Tendipedidae). Proc. of the Zoological Soc. of London 121:63-79.

45. WARWICK, W. F. 1985. Morphological abnormalities in Chironomidae (Diptera) larvae as measures of toxic stress in freshwater ecosystems: indexing antennal deformities in Chironomus Meigen. *Can. J. of Fisheries and Aquatic Sci.* 42:1881-1914.

46. WARWICK, W.F. and N.A. TISDALE. 1988. Morphological deformities in *Chironomus, Cryptochironomus* and *Procladius* (Diptera: Chironomidae) from two differentially stressed sites in Tobin Lake, Saskatchewan. *Can. J. of Fisheries and Aquatic Sci.* 45:1123-1144.

47. WIEDERHOLM, T. (Editor). 1983. Chironomidae (Diptera) of the Holarctic region. Keys and Diagnoses. Part 1. Larvae. *Entomologica Scandinavica*, Supplement 19, 457 pp.

48. ——. 1986. Chironomidae (Diptera) of the Holarctic region. Keys and Diagnoses. Part 1. Pupae. *Entomologica Scandinavica*, Supplement 28, 492 pp.

49. ——. 1989. Chironomidae (Diptera) of the Holarctic region. Keys and diagnoses. Part 3. Adult males. *Entomologica Scandinavica*, Supplement 34, 532 pp.

50. WRUBLESKI, D. A. 1987. Chironomidae (Diptera) of peatlands and marshes in Canada. *Memoirs of the Entomological Soc. of Canada* 140:141-161.

51. YOSHIMATSU, H. 1967. Feeding habits of the larvae of *Chironomus dorsalis*. Biology Institute Faculty of Liberal Arts Yamaguchi University, 115-125.

Table 1. Chironomidae Known to Occur in Saskatchewan

Tanypodinae
    Pentaneurini
        Ablabesmyia (*Ablabesmyia*) *monilis* (Linnaeus)
        + *Ablabesmyia* (*Karelia*) *illinoense* (Malloch)
        + *Ablabesmyia* (*Karelia*) *pulchripennis* (Lundbeck)
        * *Conchapelopia* (*Conchapelopia*) *telema* Roback
        + *Derotanypus alaskensis* (Malloch)
        * *Hayesomyia senata* (Walley)
        * *Rheopelopia* sp.
    Procladiini
        + *Procladius* (*Holotanypus*) sp.
        * *Procladius* (*Procladius*) *denticulatus* Sublette
        * *Procladius* (*Procaldius*) *freemani* Sublette
        * *Procladius* (*Psilotanypus*) *bellus* (Loew)
        + *Procladius* (*Psilotanypus*) *nietus* Roback
        Psectrotanypus (*Derotanypus*) *alaskensis* (Malloch)
        + *Psectrotanypus* (*Psectrotanypus*) *dyari* (Coquillet)
        *+ *Tanypus* (*Tanypus*) *punctipennis* Meigen
Diamesinae
    Diamesini
        * *Diamesa cineralla* Meigen
        * *Potthastia longimana* Keiffer
    Protanypini
        + *Protanypus* sp.
Chironominae
    Chironomini
        * *Chernovkskiia amphitrite* (Townes)
        + *Chironomus* (*Camptochironomus*) *tentans* (Fabricius)
        Chironomus (*Chaetolabis*) *atroviridis* (Townes)
        Chironomus (*Chaetolabis*) sp.
        + *Chironomus* (*Chironomus*) *atrella* Townes
        * *Chironomus* (*Chironomus*) *anthracinus* Zetterstedt
        * *Chironomus* (*Chironomus*) *decorus* Johannsen
        *+ *Chironomus* (*Chironomus*) *plumosus* (Linnaeus)
        * *Chironomus* (*Chironomus*) *staegeri* (Lundstroem)
        + *Chironomus* (*Chironomus*) *riparius* Meigen
        + *Cladopelma viridulus* (Linnaeus)
        *+ *Cladopelma* sp.
        * *Cryptochironomus conus* Mason
        * *Cryptochironomus curryi* Mason
        *+ *Cryptochironomus digitatus* Malloch
        * *Cryptochironomus eminentia* Mason
        * *Cryptochironomus fulvus* Johannsen
        * *Cryptochironomus ramus* Mason
        * *Cryptochironomus scimitarus* (Townes)
        * *Cryptochironomus stylifera* Johannsen
        * *Cryptotendipes darbyi* Sublette
        Cryptotendipes casuaris (Townes)
        * *Cyphomella gibbera* Saether
        * *Demicryptochironomus* sp.
        *+ *Dicrotendipes nervosus* Staeger
        + *Einfeldia pagana* Meigen
        *+ *Endochironomus nigricans* Johannsen
        + *Glypotendipes* (*Phytotendipes*) *barbipes* (Staeger)
        + *Glypotendipes* (*Phytotendipes*) *lobiferus* (Say)
        * *Glypotendipes* (*Phytotendipes*) *paripes* (Edwards)

+ *Glyoptendipes* sp.
* *Harnischia curtilamellata* (Malloch)
* *Microtendipes caducus* Townes
* *Microtendipes pedellus* (De Geer)
* *Nilothauma babiyi* (Rempel)
* *Parachironomus abortivus* (Malloch)
* *Parachironomus frequens* (Johannsen)

Parachironomus tenuicaudatus (Malloch)
* *Paracladopemla nereis* (Townes)
* *Paracladopemla winnelli* Jackson
* *Paralauterborniella nigrohalterale* (Malloch)
* *Paratendipes albimanus* (Meigen)
* *Phaenopsectra obediens* (Johannsen)
* *Polypedilum* (*Polypedilum*) sp. nr. *aviceps* Townes
* *Polypedilum* (*Polypedilum*) *convictum* (Walker)
* *Polypedilum* (*Polypedilum*) *fallax* (Johannsen)
* *Polypedilum* (*Polypedilum*) *illinoense* (Malloch)
* *Polypedilum* (*Polypedilum*) *laetum* (Meigen)
* *Polypedilum* (*Polypedilum*) *obtusum* Townes
* *Polypedilum* (*Tripodura*) *digitifer* Townes
* *Polypedilum* (*Tripodura*) *scalaenum* (Schrank)
* *Robackia claviger* (Townes)
* *Robackia demeijerei* (Kruseman)
* *Saetheria tylus* Jackson
* *Stenochironomus hilarus* (Walker)
* *Xenochironomus* (*Anceus*) *scopulus* Townes
* *Xenochironomus* (*Xenochironomus*) *xenolabis* (Kieffer)

Tanytarsini

*+ *Cladotanytarsus* sp.
* *Constempellina* sp.

+ *Corynocera* sp.
* *Micropsectra nigripila* (Johannsen)
* *Micropsectra dives* (Johannsen)
* *Micropsectra polits* (Malloch)
* *Paratanytarsus confusus* Palmen
* *Paratanytarsus laccophilus* (Edwards)
* *Rheotanytarsus exiguus* (Johannsen)

+ *Stempellina* sp.
* *Stempellina* sp.
* *Tanytarsus glabrescens* Edwards
* *Tanytarsus guerlus* Roback

Orthcladiinae

+ *Acricotopus senex* (Johannsen)
* *Cardiocladius* sp.
* *Corynoneura celeripes* Winnertz
* *Corynoneura* sp. nr. *taris* Roback
* *Cricotopus* (*Cricotopus*) *bicintus* (Meigen)
* *Cricotopus* (*Cricotopus*) *curtuss* Jirvenjo
* *Cricotopus* (*Cricotopus*) *politus* (Coquillett)
* *Cricotopus* (*Cricotopus*) *slossonae* Malloch
* *Cricotopus* (*Cricotopus*) *triannulatus* (Macquart)
* *Cricotopus* (*Cricotopus*) sp. nr. *tremulus* (Linnaeus)
* *Cricotopus* (*Cricotopus*) *trifascia* Edwards
* *Cricotopus* (*Cricotopus*) sp.
* *Cricotupus* (*Isocladius*) *intersectus* (Staeger)
* *Cricotupus* (Isocladius) *ornatus* (Meigen)
* *Cricotupus* (*Isocladius*) *sylvestris* (Fabricius)
* *Epoicocladius* sp.

* *Eukiefferiella* sp.
+ *Heterotanytarsus* sp.
*+ *Hydrobaenus* sp.
+ *Limnophyes* sp.
* *Nanocladius* (*Nanocladius*) *anderseni* Saether
* *Nanocladius* (*Nanocladius*) *crassocornis* Saether
* *Nanocladius* (*Nanocladius*) *spiniplenus* Saether
* *Ortholadius* (*Euorocladius*) *rivicola* Kieffer
* *Orthcladius* (*Euorocladius*) ?*rivicola* Kieffer
* *Orthocladius* (*Orthocladius*) *carlatus* Roback
* *Orthocladius* (*Orthocladius*) *mallochi* Kieffer
* *Orthocladius* (*Orthocladius*)*nigritus* Malloch
* *Orthocladius* (*Orthocladius*) *obrumbatus* Johannsen
* *Orthocladius* (*Orthocladius*) *robacki* Soponis
* *Orthocladius* (*Orthocladius*) sp.
* *Parakiefferiella* (*Parakiefferiella*) *tortulata* Saether
* *Parametriocnemus* sp.
*+ *Psectrocladius* (*Allosectrocladius*) *flavus* (Johannsen)
* *Psectrocladius* (*Psectrocaldius*) *simulans* (Johannsen)
* *Pseudosmittia* sp.
* *Synorthocladius semivirens* (Kieffer)
* *Thienemanniella* cf. *xena* Roback
* *Tvetenia vitracies* (Saether)

* Found in flowing water
+ Found in still water

* * *

Within the cells of the tiniest algae, behind the walls of the green leaf, everywhere that the unique compound chlorophyll occurs, the sun's power is held and transformed. Every living thing has been built from the products of this silent, unassuming industry. *Braun and Cavagnaro. 1971. Living Water. American West, Palo Alto, CA.*

ALBERTA SWALLOWTAILS AND PARNASSIANS: NATURAL HISTORY, KEYS, AND DISTRIBUTION

FELIX A.H. SPERLING, Section of Ecology and Systematics, Corson Hall, Cornell University, Ithaca, New York, 14853-2701, and NORBERT G. KONDLA, 6415 - 95 Avenue, Edmonton, Alberta. T6B 1A6

In this article we provide pictorial keys, distribution maps, and natural history information for Swallowtails and Parnassians in Alberta. Except for introductory sections, only information that pertains to Alberta or is new is reported. More general treatments for species can be found in existing literature.[7] Common names of host plants follow *Budd's Flora.*[6] In collaboration with C.D. Bird, G.J. Hilchie, and E.M. Pike, we are preparing a book on the butterflies of Alberta, but it will be a few more years before this project is complete. By summarizing what we know now, we hope to encourage further work on these butterflies, particularly on the natural history of more poorly known species. Figure 1 shows Papilionidae for Alberta.

Parnassians

Distinguished by hairy bodies and wings with a white ground colour and semi-transparent border, Parnassians are also easily separated from Whites by their moderately large size (50-65 mm wingspan). Females are noticeably darker than males and have a spragus, a waxy structure attached by males to the end of the abdomen of females to prevent them from mating again with other males. Parnassians are found in mountainous temperate regions and are most diverse in Asia. Isolated populations within the same species often show minor differences.

1. Phoebus Parnassian - *Parnassius phoebus* (F.)

This species is characterized by: 1) narrow white rings around each segment of the antennae; 2) black wing markings, particularly on the dorsal forewing disk; and 3) a small, dark brown spragus on the end of the abdomens of females. Both sexes tend to be smaller and darker at higher latitudes and elevations. All populations in Alberta belong to *P. phoebus smintheus* Dldy.

At Frank, Alberta, we have found larvae on Lance-leaved Stonecrop (*S. lanceolatum*). Larvae are black, with dense short hairs and small yellow spots on each segment. There is one generation of adults. They have been reported from 2 June to 10 October. The main flight may begin as early as mid-June in the southern Alberta Rockies, but is not until August in the north. Males patrol slowly over open areas where the food plant grows, flying a metre above the ground, searching for females. Adults with darker wing bases appear to be able to warm up better in the sun.[2] Adults nectar on a variety of Composites.

The Phoebus Parnassian is found throughout the Rockies of Alberta in subalpine meadows and dry, south-facing mountain slopes. The species is common in valley bottoms in the southern mountains. There is an outlying population on the valley sides of the

(D=dorsal; V=ventral;
FW= forewing; HW=hindwing)

1a. Tailed hindwing......*Papilio* 3.
1b. No tails............*Parnassius* 2.
2a. White-ringed antenna; black spot in DFW disk...*P. phoebus*
2b. All-black antenna; grey bar across DFW disk.....*P. clodius*
3a. Striped center of HW...........4.
3b. Black or yellow HW center..6.
4a. 1-tailed HW..........................5.
4b. 2-tailed HW..*P. multicaudatus*
5a. Ground color yellow or cream; stripes narrow...*P. canadensis*
5b. Ground color white; stripes wide.....*P. eurymedon*

6a. HW eyespot round and centered.....*P. zelicaon*
6b. HW eyespot connected to margin or low and oval...7.

7a. VFW disk mainly yellow and yellow hair under thorax...8.
7b. VFW disk mainly black or black hair under thorax....9.

8a. On grassland or dry riverbanks..*P. m. pikei*
8b. Boreal/montane forest ....*P. m. hudsonianus*

9a. On grassland or dry riverbanks..*P. m. dodi*
9b. Forested habitat...... *P. zelicaon X machaon*

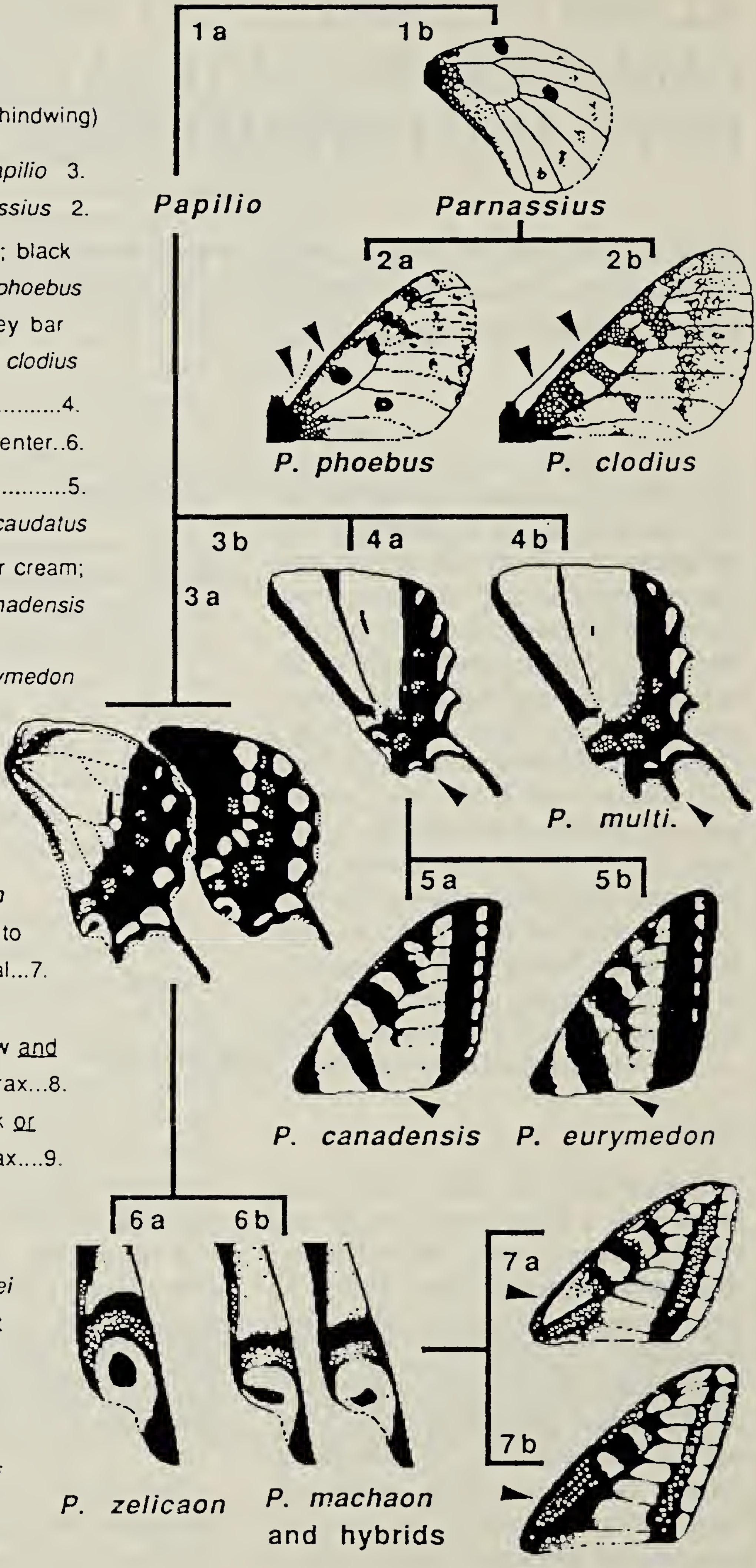


Figure 1. Alberta Papilionidae.

Milk River north of Del Bonita. This may be the only strictly prairie-dwelling population in North America. It has been found on the Saskatchewan side of the Cypress Hills, but not yet on the Alberta side, though Stonecrop grows there.[5] It is less frequently collected in the northern Rockies, where it occurs on alpine and upper subalpine rocky slopes.

2. Clodius Parnassian - *Parnassius clodius* Menetries

This species is unlikely to be encountered in Alberta except in Waterton National Park. The species is distinguished from the Phoebus Parnassian by its: 1) completely black antennae; 2) grey rather than black markings on the wing surfaces, especially in the dorsal forewing disk; and 3) a large, white spragus on the female. There are only two confirmed records for *P. clodius* in Alberta, from 1 and 12 August. They were collected by D. G. Wales at Bertha Lake (5800') and Goat Lake (6500') in Waterton National Park. Early stages are unknown in Alberta. The Clodius Parnassian is generally found in lush forest openings.

Swallowtails

Swallowtail butterflies of the genus *Papilio* L. are found worldwide. There are more than 200 species in 42 species groups; two of these groups have species in Alberta. Research on these large and beautiful butterflies has provided a great deal of support for conservation and insight into the process of evolution.[1] In Alberta, Swallowtails are distinguished from other butterflies by their large size (wingspan more than 75 mm), hindwing tails, and a bold black and (usually) yellow colour pattern. Like Parnassians, the larvae have osmeteria, which are fleshy, smelly tubes that larvae evert from just behind their head to discourage predators. Early instar larvae are black with a white patch in the middle and have spines with fleshy bases; they look like unappetizing bird droppings. The eggs are spherical and green or yellowish. Pupae are held upright against twigs by a silk girdle, resembling leaves or broken branches. Pupae are either green or brown, depending on the background, and are the overwintering stage. They are often parasitized by large black Ichneumon wasps (*Trogus* spp.).

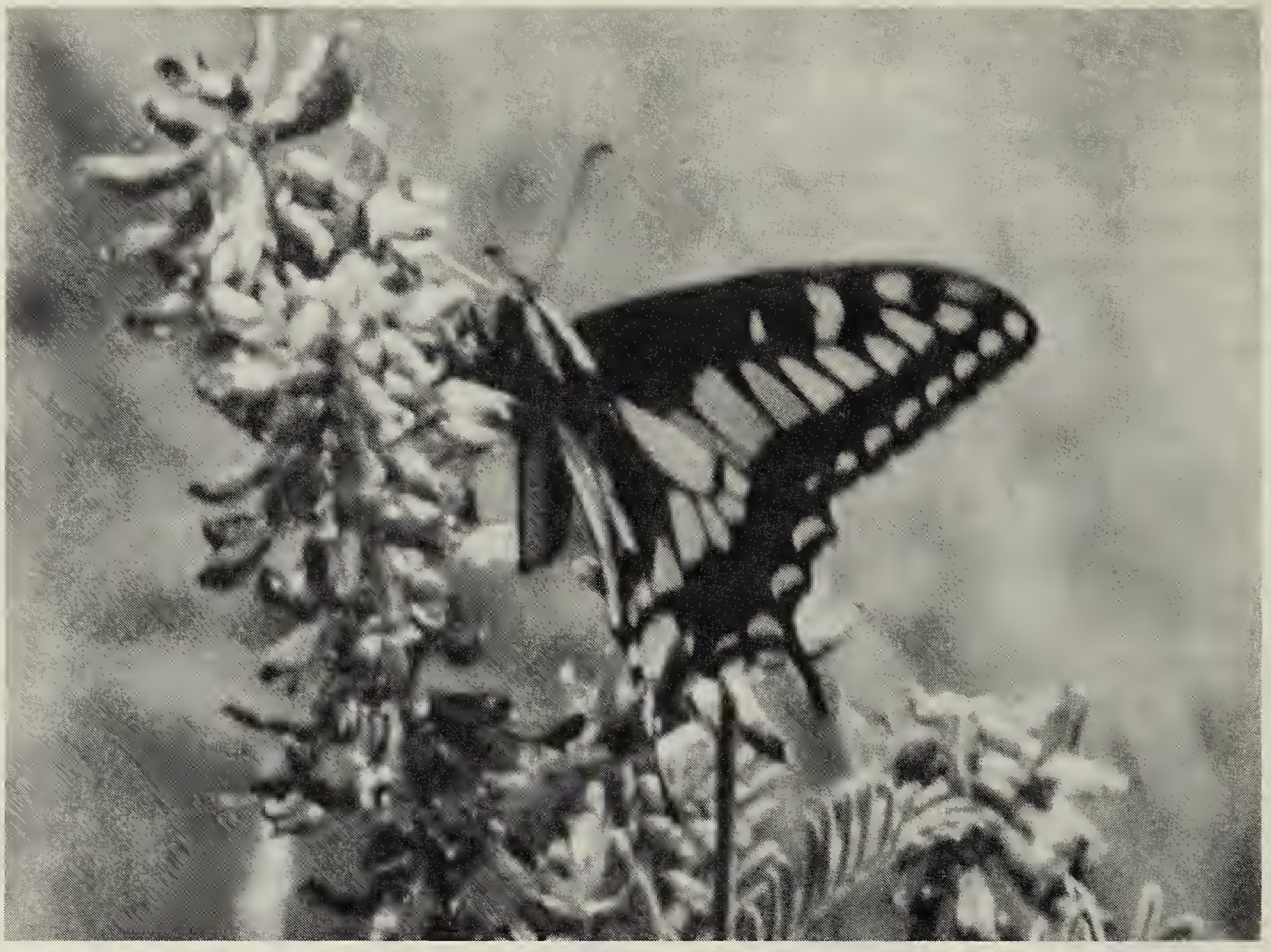
Old World Swallowtail Species Group

Members of this species complex, the *Papilio machaon* group, are found throughout most of the northern hemisphere. There are about six species in the group. Late instar larvae have black and green bands on each segment, interspersed by small yellow or orange spots. The ratio of yellow to orange spots varies geographically and can help to distinguish populations. Larvae feed on numerous species of Umbellifers, as well as a few Composites, both of which are unusual food plant families for Swallowtails.

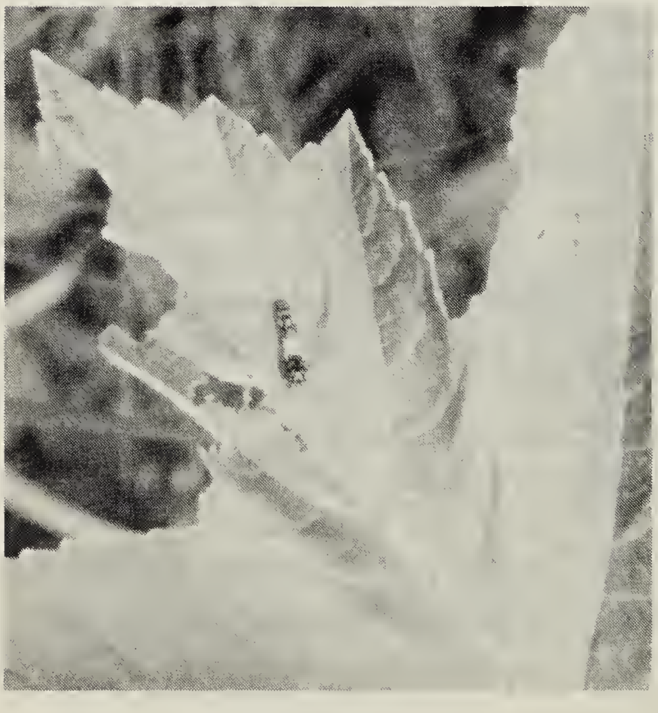
The most common adult form in Alberta is predominantly yellow with black markings along the veins and outer borders. A dark morph, present in varying proportions, is characterized by a predominantly black pattern on the wings and yellow spots rather than a yellow band on the abdomen. Males of the Old World Swallowtail group usually patrol grassy or sparsely treed hill tops with good nectar sources and a panoramic view. Encounters by patrolling males lead to a short chase, while females are pursued until they land in a grassy spot and mate. Although species generally maintain their integrity when they meet, Swallowtails of the Old World group sometimes form interspecific hybrid populations.[8,9]

3. Old World and Artemisia Swallowtails - *Papilio machaon* L.

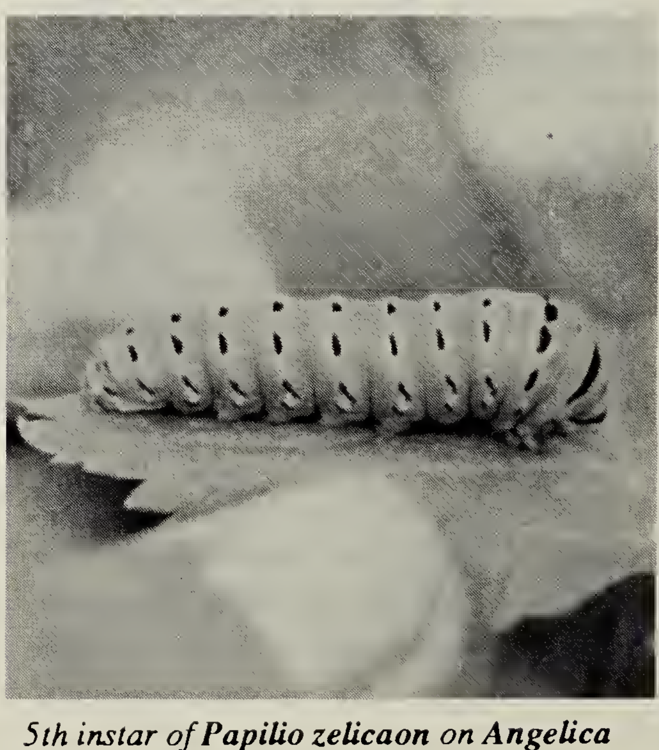
The Old World and Artemisia Swallowtails are best distinguished by the shape of the hindwing eyespot on upper side of the inner margin of the hindwing.



Papilio machaon dodi, *Drumheller, Alberta.* *Felix Sperling*



3rd instar of ***Papilio zelicaon*** *on* ***Heracleum lanatum***, *Buck Mountain, Alberta.* *Felix Sperling*



5th instar of ***Papilio zelicaon*** *on* ***Angelica*** *leaf.* *Felix Sperling*

This eyespot is club-shaped and connected to the margin, or at least oval and low in the area of red scales. Three subspecies occur in Alberta and, to reduce confusion, we refer to them by their Latin names. *P. m. dodi* McDunnough is found in southern Alberta and was named after F. H. Wolly Dod, an early lepidopterist in Alberta. *P. m. pikei* Sperling was recently discovered in the Peace River region and named after another Albertan, E.M. (Ted) Pike. *P. m. hudsonianus* Clarke occurs, as its name suggests, in the Hudsonian region of Canada. As Hooper later reported, Swallowtails originally identified as *P. bairdii brucei* Edwards in *The Butterflies of Saskatchewan* actually are the summer generation of *P. m. dodi.*[4,5] Butterflies that Hooper referred to as Badlands Old World Swallowtails ("*P. machaon ssp.*") are the spring generation of *P. m. dodi.*[4] Butterflies that Hooper referred to as Cypress Hills Old World Swallowtails ("*P. m. dodi*") appear to be a hybrid population between *P. zelicaon* (the Zelicaon Swallowtail) and one or more subspecies of *P. machaon.*[4]

Spring generation adults of *P. m. dodi* look much like *P. zelicaon.* Summer generation adults generally have more yellow scales and hairs. Dark morph adults comprise less than 2% of any population in Alberta. *P. m. dodi* also tends to have more pointed forewings and narrower hindwing tails than *P. zelicaon.* Both *P. m. pikei* and *P. m. hudsonianus* are distinguished by yellow hair extending around the underside of the thorax and by yellow scales at the base of the underside of the forewing. The latter two subspecies are separated by habitat and locality.

Larvae of *P. m. dodi* and *P. m. pikei* feed exclusively on Linear Leaved Wormwood (*Artemisia dracunculus*), as do other subspecies of *P. machaon* found in the western United States. Not all pupae of *P. m. dodi* or *P. m. pikei* that are produced in the late summer of a given year will emerge during the following year. A small proportion will wait an additional year or more to emerge, avoiding the kind of drought that scorches host plants such as the one that occurred in southern Alberta in 1985. The larval food plant of *P. m. hudsonianus* has still not been established. Judging from a photo of a late instar larva taken by Gary Anweiler in Saskatchewan, the food plant may be Palmate-leaved Coltsfoot (*Petasites palmatus*). It is possible that larvae of *P. m. hudsonianus* also feed on Umbellifers.

P. m. dodi has been collected from 3 May to 23 August. The peak for the first generation is the second half of May and the first half of June, while for the second generation it is late July and early August. *P. m. pikei* has been recorded from 9 June to 9 July. *P. m. hudsonianus* has been collected in Alberta from 31 May to 28 July, but most were collected in the second half of June. Males of *P. m. dodi* and *P. m. pikei* tend to fly along the upper edge of deep river valleys and accumulate at prominences. Males also patrol slopes well below valley edges, looking for females near larval food plant patches. Nectar sources include Groundsel (*Senecio* spp.), Sweet Broom (*Hedysarum* spp.) and Alfalfa (*Medicago sativa*). *P. m. pikei* and *P. m. dodi* occur in dry grassland habitats along eroding river banks, badlands, and road cuts near the larval food plant. Populations are patchily distributed along major river valleys and badlands. In contrast, *P. m. hudsonianus* is found in the boreal forest region, especially openings along roads, bogs or sparsely treed hill tops. It is infrequently collected in Alberta, but is distributed over a broad region.

4. *Papilio zelicaon* X *machaon*

Hybrid individuals are difficult to recognize. By definition they are normally rare and, if back-crosses are possible, hybrids can exhibit the full range of character combinations between the parental species. *P. zelicaon* and *P. machaon* form hybrid populations in west-central Alberta and the Cypress Hills; Hooper refers to the Cypress Hills Old World Swallowtail hybrids.[4,8] Hybrid adults look much like *P. m. dodi*, and are best distinguished by molecular characters and by habitat and locality. Most individuals from hybrid populations have a club-shaped eyespot, but have a rounded wing shape much more like that of *P. zelicaon*. The parental species seem to hybridize much less frequently in the southern Alberta prairies and in the Peace River region, as well as where their ranges overlap in the rest of western North America. Most hybrid populations occur in mixed forest, between 1000 and 2000 m elevation.

Larvae of hybrid populations are found on Heart-leaved Alexanders (*Zizia aptera*) in the area west of Calgary and on Cow Parsnip (*Heracleum lanatum*) in the moister areas north and west of Red Deer. At Bragg Creek, immediately west of Calgary, most larvae have yellow spots which distinguish them from the orange spotted larvae of *P. m. dodi* at Calgary and eastward. *P. zelicaon* X *machaon* hybrid Swallowtails have been collected in the Alberta foothills from 22 May to 2 August, with the main flight period in the first half of June. Sometimes typical *P. zelicaon* adults are collected at the same localities later in the summer; these may have dispersed from pure *P. zelicaon* populations in mountains to the west. Hybrid Swallowtails in the Cypress Hills have mostly been collected in late June and early July. Where hybrids are rare, most specimens are collected together with apparently pure *P. zelicaon* or *P. machaon*. The latest records for any Swallowtail in the southern Alberta prairies (28 September) and the Peace River region (22 July) were for hybrids.

The mating behaviour of *P. zelicaon* and *P. machaon* is very similar, and it is easy to see how hybrids could occur. It is more difficult to understand why the species don't merge wherever they contact each other. The frequency of hybrids is higher in areas where contacting populations of the parental species have more similar habitat preferences. Thus the relative viability of hybrid individuals, rather than different mating behaviour, may determine whether hybrid populations will form. However, actual observations of natural matings are rare and the two species might also have mating barriers in dry land regions, in addition to staying out of each others' way as an indirect consequence of different habitat preferences.

5. Zelicaon Swallowtail - *Papilio zelicaon* Lucas

Adults of *P. zelicaon* are best identified by the round and centred anal eyespot on the upper side of the hind-wing. They usually have more black coloration than *P. machaon*, especially at the base of the ventral forewing and on the thorax and abdomen. The black adult "nitra" morph may comprise up to 10% of some populations in southern Alberta.

Larvae feed entirely on Umbellifers and will not feed on Narrow-leaved Wormwood. Eggs are laid on flower heads or leaves. In the Waterton area, larvae tend to occur on Lyall's Angelica (*Angelica arguta*), while in northern Alberta they tend to occur on Cow Parsnip. Larvae have also been found in Alberta on Mountain Parsnip (*Angelica dawsoni*), Kneeling Angelica (*Angelica genuflexa*), Mountain Wild Parsnip (*Lomatium dissectum*), Western Wild Parsley (*Lomatium triternatum*), Water Parsnip (*Sium suave*), and Heart-leaved Alexanders, as well as two cultivated Umbellifers, Garden Celery (*Apium graveolens*) and Garden Parsnip (*Pastinaca sativa*). The main larval food plant on the prairies of southern Alberta is unknown, though it seems likely to be a Prairie Parsley (*Lomatium* spp.).

There is almost always a single generation per year for *P. zelicaon*. The main flight period is variable, with adults generally emerging later in cooler habitats, especially in the mountains. Adults have been collected in Alberta from 23 April to 19 August, though the main flight period varies from the second half of May in the Wintering Hills south of Drumheller, to the first half of July, in Waterton National Park. A few fresh adults have been collected near Drumheller in early August. A common nectar source for hill-topping male *P. zelicaon* is dandelion. *P. zelicaon* is generally found in moist meadows in forested areas, but in Alberta it can also be found in habitats ranging from parkland and prairie hill tops to subalpine meadows. Adults occasionally hilltop even on alpine peaks. Whenever males of both colour morphs occupy the same hill top, it seems that the black ones occupy the choice spots on the very peak of the hill. Very little data has been collected on the mating behaviour of these species, however, and this very interesting situation awaits someone with a little time and patience to study it.

The Tiger Swallowtail Species Group

This species complex, the *P. glaucus* group, is the only species group of Swallowtails that is restricted to North America and adjacent Central America. Like the *P. machaon* group, the *P. glaucus* group is most diverse in western North America. Six species are currently recognized, and most of these hybridize occasionally where their ranges meet or overlap. Late-instar larvae have a distinctive pattern, with large eyespots on the thoracic segments, followed by a single band and a smooth green background. They feed on the foliage of a wide variety of trees and shrubs. Pupae are similar to those of the *P. machaon* group, but are slightly narrower and less bent. Adults have a distinctive pattern of black stripes on a yellow or white background – hence their common name.

6. Canadian Tiger Swallowtail - *Papilio canadensis* Rothschild and Jordan

Previously considered a subspecies of the Eastern Tiger Swallowtail (*Papilio glaucus*), the Canadian Tiger Swallowtail has recently been given species status on the basis of a number of genetic differences and the relatively narrow hybrid zone it forms with *P. glaucus*.[3] It is the only member of the species group that occurs in central and northern Alberta. The ground colour of males is always yellow when they are fresh, but females may be either a lighter cream-yellow or a more orangy-yellow than the males. The wingspan is 8.5 to 10 cm in Alberta, and there is only one tail per hindwing. The Western Tiger Swallowtail (*Papilio rutulus*) sometimes hybridizes with the Canadian Tiger Swallowtail in southern British Columbia. Apparently the only difference in adult colour pattern is that Western Tiger Swallowtail has no orange marginal spots on the underside of the hindwing.[7]

Larvae have been collected on Aspen Poplar (*Populus tremuloides*), Willow (*Salix* sp.) and Domestic Crabapple (*Malus* sp.) in Alberta. Eggs are laid on the middle of the upper side of small leaves, about 1 mm from the central vein. The egg is bright green when laid, and has a deep yellow ring of cement at the base, which dries clear in about 5 minutes. Larvae spin a silk mat on the leaf on which to rest when they are not feeding.

Adults have been collected from 12 May to 12 August, with the main flight in June. Adults are common along trails through mixed forest, or along the edges of aspen parkland. Males tend to patrol along streams, forest edges and trails, but also accumulate on hill tops or congregate on wet soil. Females fly in the same habitats, but have a faster and more circuitous flight than males, as they search for leaves on which to lay their eggs. Both sexes nectar at a variety of flowers, especially dandelions. The Canadian Tiger Swallowtail can be found commonly throughout most of Alberta except the southern grasslands, where it is uncommon and local.

7. Two-Tailed Swallowtail - *Papilio multicaudatus* Kirby

This species looks much like the Canadian Tiger Swallowtail, but has a second, smaller tail on each hindwing. Its wing stripes are also a bit narrower and its wingspan is usually more than 10 cm. Its background colour is the same yellow shade as in male Canadian Tiger Swallowtails. There are no larval records yet for Alberta.

Adults have been collected from 7 June to 2 September, and most are from late June. The Two-tailed Swallowtail is found only on the U.S.-Alberta border, at Waterton National Park, along the Milk River (especially at Police Coulee) and rarely north to Lethbridge. It flies along coulees and the edges of riverine forest. The large wingspan of this butterfly makes it a particularly fast flier and well suited to soaring. It commonly nectars on thistles (*Cirsium* spp.).

8. Pale Swallowtail - *Papilio eurymedon* Lucas

This species has the black wing stripes shared by other species in the Tiger Swallowtail group, but its background colour is pale white, without any yellow. The wing bands are wider than the other species and are usually substantially wider than the white areas between them. There is only one tail on each hindwing, and the wingspan is 9 to 10 cm in Alberta.

Immatures of the Pale Swallowtail have not been recorded yet in Alberta. The species is found in the southwestern corner of Alberta, north to the Crowsnest Pass and east to Police Outpost. Many Waterton records may represent strays from British Columbia. In Alberta it has been collected from 23 June to 1 August. It is found in dry, montane forest and the species is our rarest Swallowtail in Alberta.

Acknowledgements

We thank C.D. Bird, G.J. Hilchie, E.M. Pike, H. Pinel and many other collectors of Alberta butterflies for natural history and distributional information.

1. COLLINS, N.M. and M.G. MORRIS. 1985. Threatened Swallowtail Butterflies of the world. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

2. GUPPY, C.S. 1986. Geographic variation in wing melanism of the butterfly *Parnassius phoebus* F. (Lepidoptera: Papilionidae). *Can. J. Zool.* 64: 956-962.

3. HAGEN, R.H., R.C. LEDERHOUSE, J.L. BOSSART and J.M. SCRIBER. 1991. *Papilio canadensis* and *P. glaucus* are distinct species. *J. Lepidop. Soc.* 45: in press.

4. HOOPER, R.R. 1973. Butterflies of Saskatchewan. Sask. Museum of Natural History, Regina.

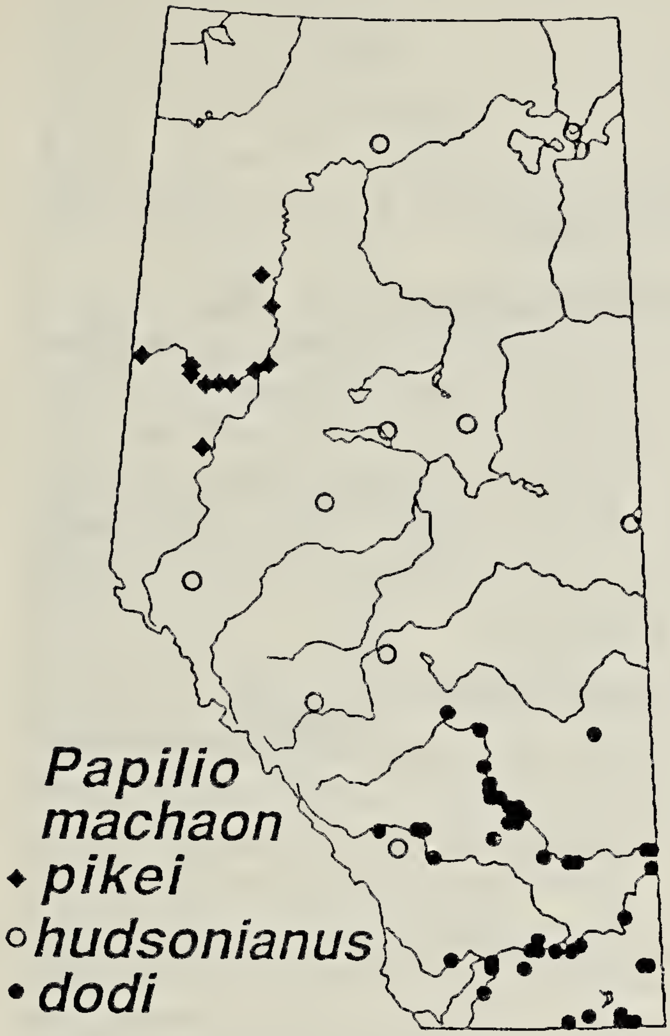
5. ——. 1986. Revised checklist of Saskatchewan butterflies. *Blue Jay* 44: 154-163.

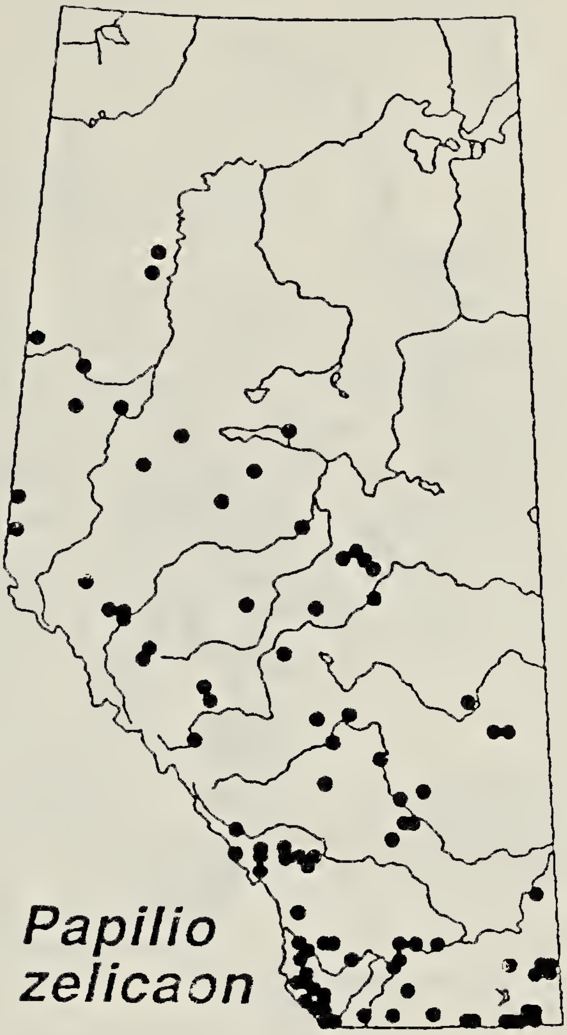
6. LOOMAN, J. and K.F. BEST. 1979. Budd's Flora. Research Branch, Ag. Can. Publ. 1662.

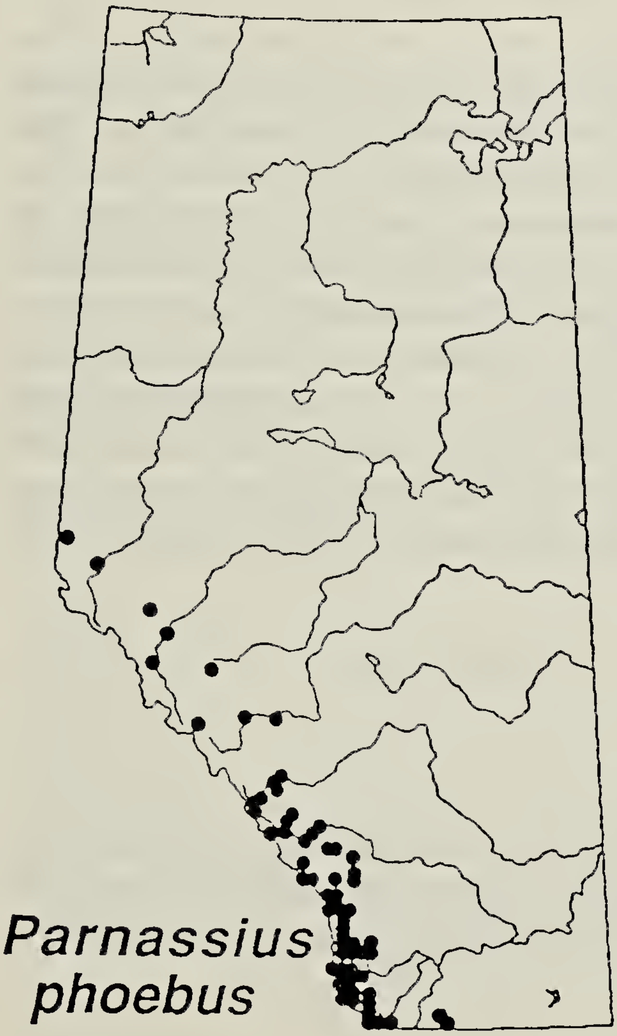
7. SCOTT, J.A. 1986. The butterflies of North America. Stanford Univ. Press, Stanford. 583 pp.

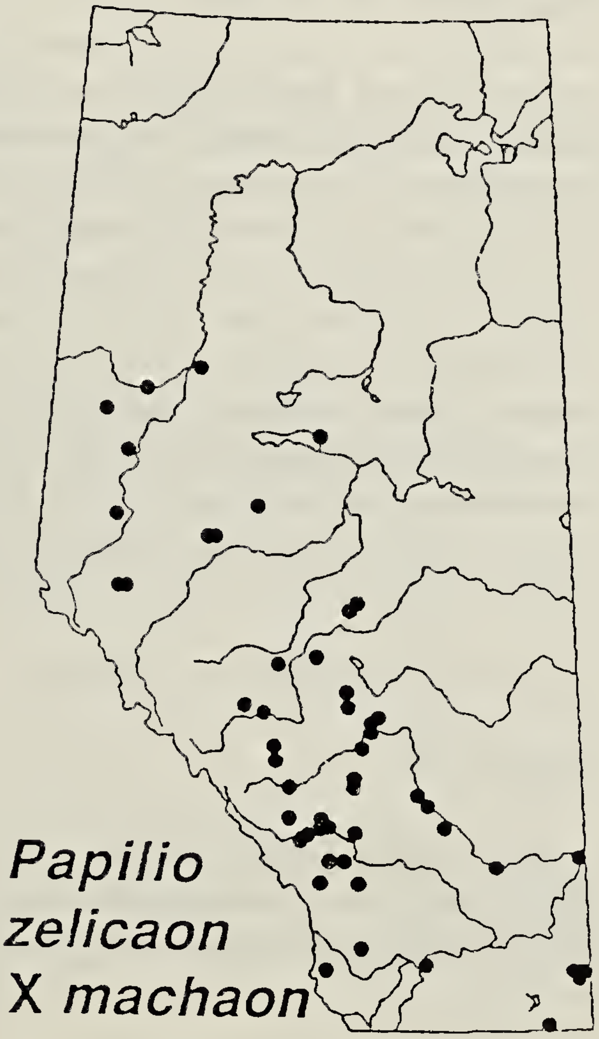
8. SPERLING, F.A.H. 1987. Evolution of the *Papilio machaon* species group in western Canada. *Quaestiones Entomologicae* 23: 198-315.

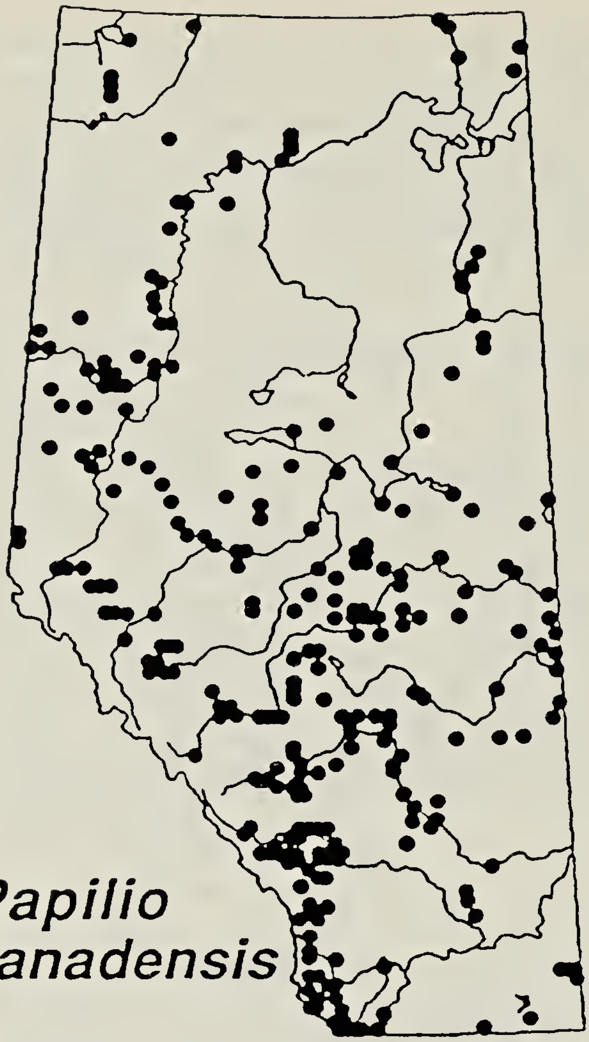
9. ——. 1990. Natural hybrids of Papilio (Insecta: Lepidoptera): poor taxonomy or interesting evolutionary phenomenon? *Can. J. Zool.* 68: 1790-1799.


Papilio
machaon
◆ pikei
○ hudsonianus
● dodi

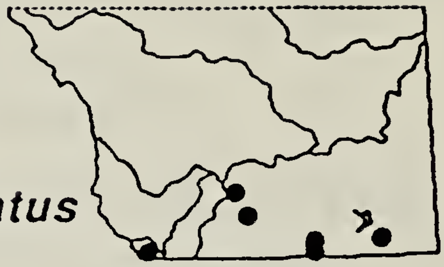

Papilio
zelicaon


Parnassius
phoebus

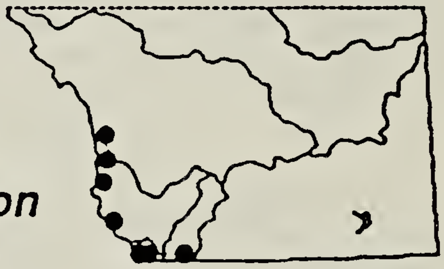

Papilio
zelicaon
X machaon



Papilio canadensis



Papilio multicaudatus



Papilio eurymedon

LETTERS

BLACK SWALLOWTAIL
Dear Editor:

I much enjoyed *Blue Jay* Vol. 49, No. 2, June 1991. The colourful photograph by Michael Crawford of the Trumpeter Swan is indeed inspiringly beautiful. ... What prompted me to write after reading all about your lovely moths, in the June issue, was the rare Black Swallowtail Butterfly, that has been here for over two months, June and July. They regularly visit my huge sunflowers, which I plant for all species of wild birds. This butterfly was indeed a beautiful sight, with shimmering metallic blue on the hind wings. He floated from flower to flower, feeding upon the nectar of each blossom. Many times he would drift to ground level at my feet and alight upon small, young, growing Queen Ann's Lace or wild carrot. On the delicate fragile tiny leaves he would rest or find some morsel of food of which I would not know because there were no flowers, just delicate leaves. I am lucky to have found the rare Black Swallowtail feeding upon my huge sunflowers.

Marie Peronne, 10013 Greiner Road, Clarence, New York. 14031

Dear Marie,

According to Ronald Hooper of the Saskatchewan Museum of natural History, the Black Swallowtail found on the leaves of Queen Ann's Lace would possibly be a female laying eggs. Queen Ann's Lace is the food plant for this butterfly. Thank you for writing.

Editor.

UNUSUAL BARN SWALLOW NEST SITE

DALE HJERTAAS, 15 Olson Place, Regina, Saskatchewan. S4S 2J6

I usually like to fill out a nest record card for each bird nest I locate. However, I had a problem filling out the card for a Barn Swallow nest in Coalfield's PFRA community pasture on 6 June 1990. Height above ground was the difficulty; I finally noted "varies from 10 to 14 feet."

Frank Switzer, Keith Barr and I were censusing birds in this pasture east of Estevan when we noticed two Barn Swallows flying around an oil pumping unit. As it was several miles to any building, I felt the swallows must be nesting on the pumping unit. A search around the frame and engine housing revealed nothing. Then I watched a Barn Swallow fly to the pump head. Where the head attached to the huge pivoting beam which tilts back and forth to lift the oil was a nice sheltered ledge, ideal for a Barn Swallow nest, except that it was constantly moving up and down and the angle of the beam was changing constantly. Nonetheless the Barn Swallow was busily working on a 75% completed nest, apparently perfectly satisfied with a moving platform.

At the oil pumping unit on the next LSD we were surprised to notice a second pair of Barn Swallows building their nest on the same sheltered ledge at the pump head. Later that day, while Keith Barr and I were returning to Regina we stopped at an oil well site near Weyburn and noted an old Barn Swallow nest on the head of this oil pump. However, we have no way of knowing whether the pump was active in the year the nest was built.

Could these swallows have started their nests during a temporary shutdown of the wells or has a local tradition developed of using the moving pump heads due to the total lack of other suitable nest sites? The fact the Barn Swallows were building while the pump head moved suggests they were willing to start and build on the active pump. However, it is possible that the first nestings on these pumps could have occurred on a shutdown pump. Once the image of the pump head as a suitable site developed, its use may have spread to active pumps.

Would constant shifting have an impact on the eggs and chicks? Unfortunately, I was not able to revisit the area and so do not know if either nest was successful.

NESTING SWALLOWS ON THE GO

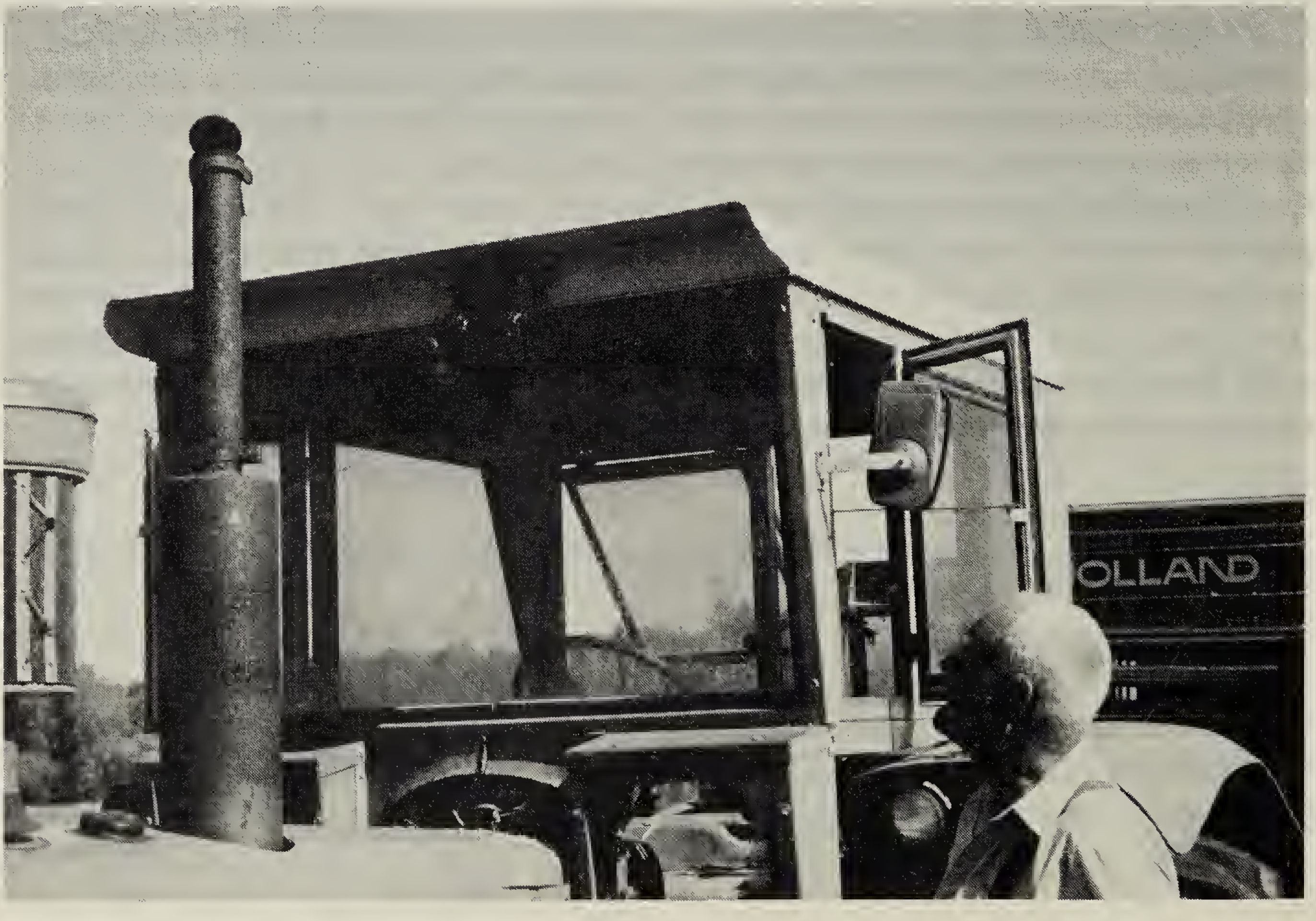
DONALD F. HOOPER, Box 40, Somme, Saskatchewan. S0E 1N0 and FRANK SWITZER, 1301 Shannon Road, Regina, Saskatchewan. S4S 5K9

In this rush and go age Barn Swallows are really getting into the swing of things and have been found nesting in mobile situations.

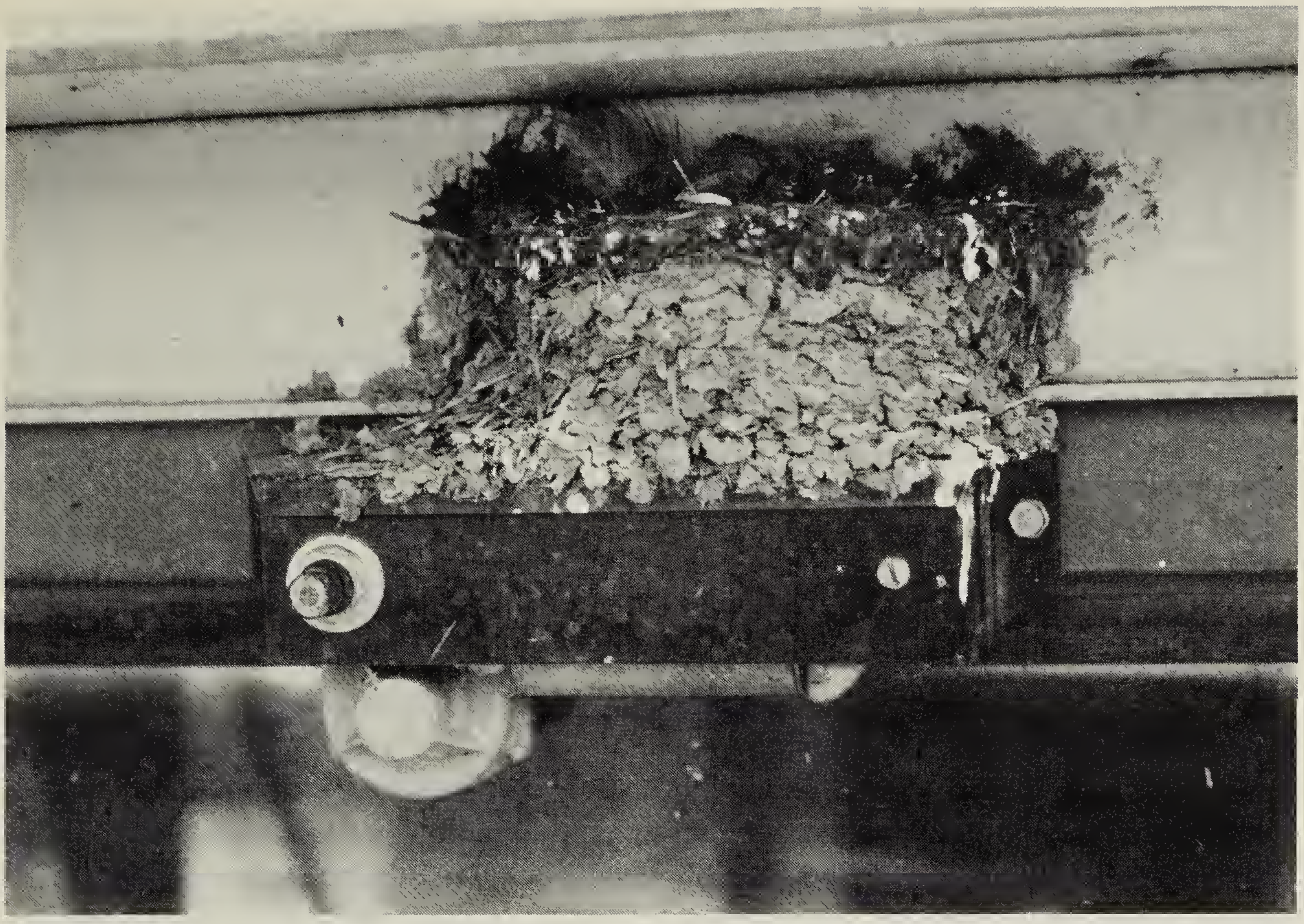
On 9 August 1991, Phillip Peterson and Grant Chase were putting up hay on Chase's ranch, along the Piwei River meadow south of Somme. Phillip drove the 4020 John Deere tractor four km from the ranch corrals and proceeded cutting hay with the haybine. As he went around the meadow he wondered why a pair of Barn Swallows were diving in front of the window of the tractor cab. When he stopped he found that they had a nest with four young above the windshield, under the overhang of the cab roof. As he drove along the meadow the adult birds, who had followed from the ranch yard, were feeding the young on the go.

The river meadow is rough with beaver and muskrat holes and it is a wonder that the young weren't bounced out of the nest. Also, to withstand such jarring, the nest must have been attached to the cab with "super glue."

The adults stayed right with the tractor and fed the young on the move each day as the hay was being cut and baled, along five km of river meadow. The four young remained healthy and in time left the nest, apparently none the worse for the roaring lullaby of a diesel tractor with its fumes and smoke. Instead of gentle rocking there was the rugged treatment of shaking, jolting and bouncing.



Grant Chase is puzzled about his haying companions. *Donald F. Hooper*



Barn Swallow nest on tractor cab. *Donald F. Hooper*

The eagle as a symbol of reincarnation appears in the Bible: where the Psalms say "Thy youth is renewed like the eagle's," the reference is to the belief that every ten years the eagle soars into the sky and into the flaming sun itself, then plunges into the sea where it moults and reemerges with new plumage and new life. *Dennis Bardens. 1987. Psychic Animals. Holy, NY.*

******

The whole secret of the study of nature lies in learning how to use one's eyes.
George Sand.

CLARK'S GREBES AND SUSPECTED WESTERN X CLARK'S GREBE HYBRIDS IN MANITOBA

BRUCE A. EICHHORST and BARRY D. PARKIN, Department of Biology, Box 8238, University of North Dakota, Grand Forks, North Dakota. 58202

The Clark's Grebe was recently resurrected to species rank, as originally described by George N. Lawrence in 1858.[2,4] Prior to 1985, it was considered a colour phase of the Western Grebe.[1] These two grebes overlap considerably through much of their ranges, but the frequency of Clark's Grebes in Canadian populations is generally considered to be much less than 1%.[5] To date, no more than six Clark's Grebes have been reported from any one Canadian site, and the first documented nesting occurred in 1986 at Pelican Lake, Manitoba.[5] In this paper we report on our observations of Clark's Grebes and suspected Western X Clark's hybrids on the East Delta Marsh, Manitoba.

From 8 June to 1 July 1989, we visited the Delta Waterfowl and Wetland Research Station to collect grebes for a study on genetic variation. The Delta Marsh system is located at the southern end of Lake Manitoba and consists of three management units. We restricted our work to a portion of the east unit (hereafter referred to as the East Marsh;

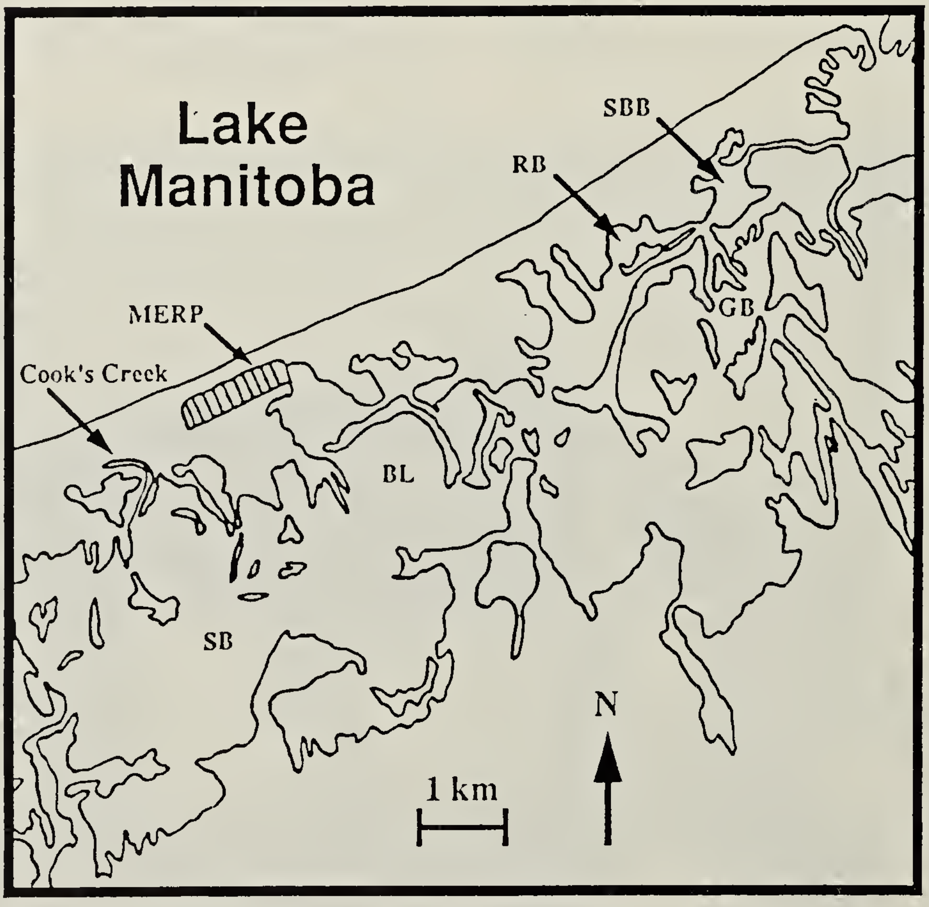


Figure 1. Location of four areas (BL, GB, RB, and SBB) on the East Delta Marsh, Manitoba where Clark's Grebes and intermediates were observed in 1989. BL, Blackfox Lake; GB, Gadwell Bay; RB, Riley's Bay; SB, Simpson Bay; SBB, Small Bluebill Bay; MERP, Delta's Marsh Ecology Research Project area.

see Fig. 1). The East Marsh, which contains a series of interconnected large and small shallow bays is described in detail elsewhere, and the nesting ecology of Western Grebes on the East Marsh has also been described.[3,10,13]

Our first sighting of Clark's Grebes occurred the morning of 8 June, when we canoed through Simpson Bay and then went east to Blackfox Lake. We observed five Clark's (two pairs and one individual) at Blackfox Lake. During the afternoon of the same day, we observed five additional Clark's as we canoed through Riley Bay and Small Bluebill Bay (Fig. 1).

During the 20 days that we spent on the East Marsh, we observed Clark's Grebes in four areas that contained Western Grebe colonies. Blackfox Lake supported the largest number of Clark's; nine separate individuals were observed on 19 June. We were able to locate four Clark's nests at Blackfox Lake. In Small Bluebill Bay we observed one pair of Clark's on 8 June and observed a single Clark's at a nest on 16 June. On 13 June we observed four Clark's in Gadwell Bay and observed two Clark's at a nest on 18 June. In Riley Bay we observed three Clark's on 8 June and located one nest on 14 June.

Of the 18 Clark's Grebes that we observed, three of them were lived-trapped at their nests. The first Clark's we trapped was from the above-mentioned Riley Bay nest. It was a female that was paired with a suspected hybrid male, which we trapped on the same attempt (Fig. 2). The other Clark's that we trapped were from two separate nests on Blackfox Lake.

We observed suspected hybrids (i.e. intermediate-facial plumage and/or bill colour) in those areas of the East Marsh that contained Clark's Grebes. Adults that have intermediate facial/bill characters are possible hybrids, but it has yet to be confirmed by raising known hybrid chicks. We collected nine such intermediates and observed at least that many more.

In the intermediates that we collected, the black of the crown either bisected the eye or extended just below the eye, and the colour of the lores ranged from dark-grey to white. Bill colour ranged from dull greenish-yellow to a dull yellowish-orange, which can best be described as intermediate between the bright orange-yellow typical of Clark's and the dull greenish-yellow typical of Westerns. All intermediates collected had some orange on the lower mandible, mainly on the ventral surface near the base. On the black and white photograph (Fig. 3) of the intermediate male, the area of orange is not readily discernable. However, in the literature there are some colour photographs of intermediates that illustrate this bill colour characteristic. Szafranski's photograph of three adults rushing across the water, illustrates the difference between the bill colour of typical Westerns (male and female pictured on the left and the right, respectively) and the bill colour of an intermediate (male in the middle).[12] The orange area of the intermediate's lower mandible is quite noticeable; the overall bill colour is dull yellowish-orange and the black crown bisects the eye. The thin patch of bare skin, which extends from the base of the upper mandible to the eye, is also orange. We found this patch of skin to be dark green in Westerns, orange in Clark's, and variable in intermediates. In Nuechterlein's photograph of an intermediate female sitting on a nest with chicks, the orange area of the lower mandible appears to be small and restricted to the base area.[11] Overall bill colour is that of a typical Western and the black crown bisects the eye. However, in comparison to Szafranski's intermediate, the lores are whitish.

Based on our observations, at least 18 Clark's Grebes and 18 intermediates (i.e.

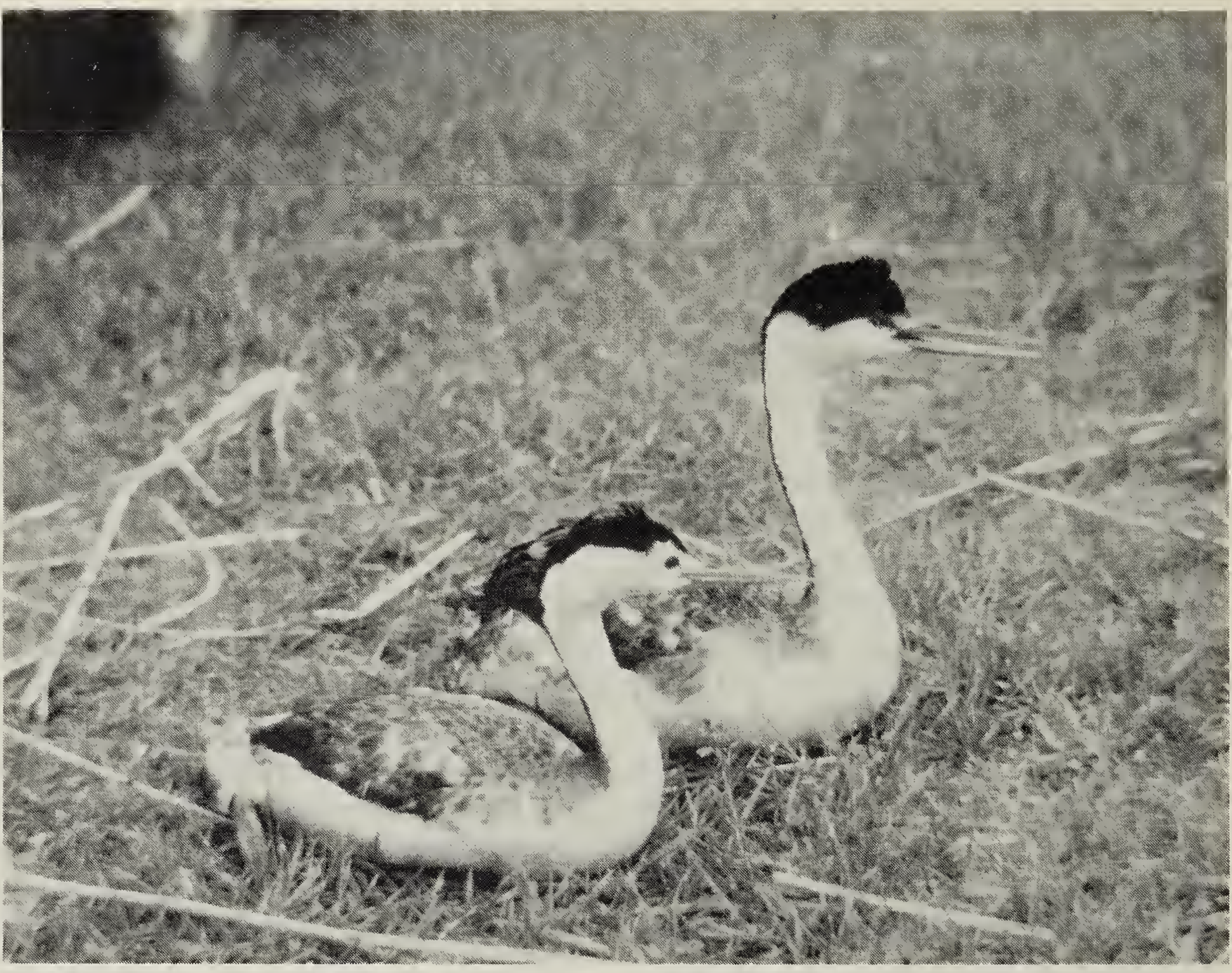


Figure 2. Female Clark's Grebe mated with intermediate male. Pair was trapped at their nest in Riley Bay on 20 June, 1989. *Bruce Eichhorst*

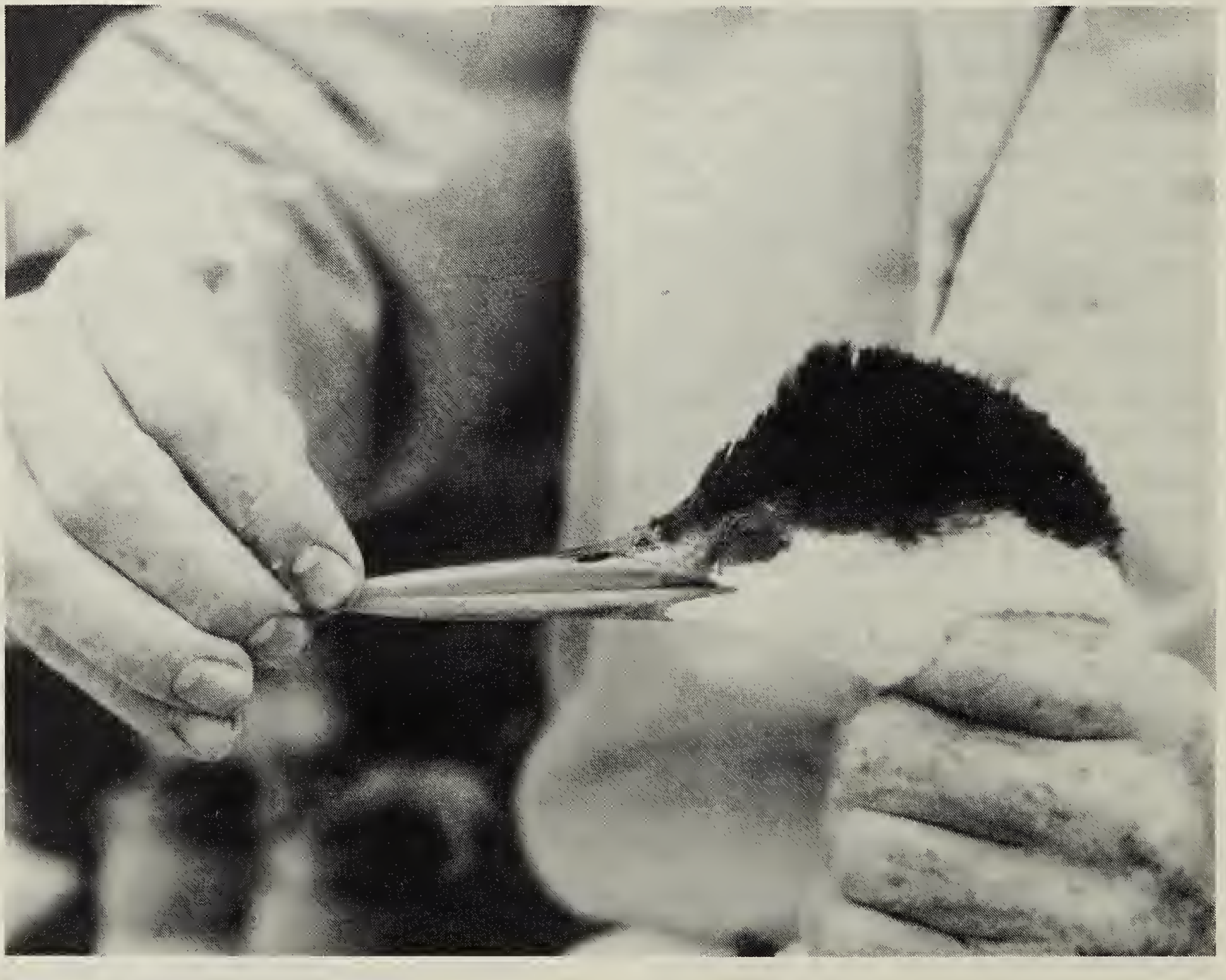


Figure 3. Close-up of intermediate male. *Bruce Eichhorst*

suspected hybrids), were present in the combined areas of Blackfox Lake, Riley Bay, Small Bluebill Bay, and Gadwell Bay. Because of the large size of the East Marsh (4,620 ha of main water bodies) and our mode of transport (canoe), we restricted our efforts to those four areas. Since no attempt was made to locate all nesting colonies, it is probable that more than 18 Clark's were present on the East Marsh in 1989.[3] We estimate that approximately 1,000 to 1,500 grebes were present in those four areas, which would put the frequency of Clark's between 1.2% and 1.8%; among the highest documented for Canadian populations. This raises the question of whether Clark's have always been present at this frequency, or whether the frequency we observed is the result of recent movements northward from southern populations. We believe it is the latter. Nuechterlein studied the nesting ecology of Western Grebes on the East Marsh from 1973-1974, but did not observe any Clark's (pers. comm.). During his behavioral studies, most of which were conducted at Marshy Point, Manitoba, from 1975-1979, he observed one Clark's each at Delta's East Marsh and Marshy Point (pers. comm.). During a visit to the East Marsh in 1986, he observed one pair of Clark's (pers. comm.).[5]

The recent (1987-1991) drought in the western U.S. has reduced the number of suitable nesting areas for Clark's Grebes (unpubl. information from various state wildlife agencies; Eichhorst, pers. obs.). In addition, important Clark's nesting habitat was recently lost at the Bear River Migratory Refuge, Utah, when Great Salt Lake experienced consecutive record-breaking lake level rises from 1983-1986.[6] It is very probable that Clark's have responded to these changes/losses by migrating further north than usual to find suitable nesting habitat.

In Saskatchewan, six Clark's were observed at the north end of Last Mountain Lake on 14 and 15 June 1988; and on 1 June 1989, five were reported in the same area among 323 Westerns.[8,9] In July 1990, three Clark's Grebe families were observed at the Valeport Marsh.[10] De Smet observed at least five Clark's in 1986 on Pelican Lake, Manitoba, in a colony of about 500 Westerns.[5] Two Clark's were observed there in 1987 and three in 1988.[7,8] We surveyed Pelican Lake on 3 June 1989, and observed fewer than 20 Westerns on the entire lake. A local resident informed us that Western Grebes had arrived in early spring but departed shortly thereafter. The grebes most likely departed due to the water levels in the bulrush (*Scirpus* spp.) beds, which were too low for nesting (pers. obs.). If any Clark's were among the arriving Westerns they may have continued northward, possibly ending up at the East Marsh.

As De Smet stated, "Western Grebe colonies throughout Canada need to be more carefully scrutinized to better understand the status and distribution of the Clark's Grebe."[5] We strongly encourage birders and ornithologists to venture out into Canada's marshes to search for and count Clark's Grebes. Such data will help document local and regional changes over time, and will provide much needed information on topics such as hybridization rates (i.e., count adult intermediates or mixed pairs with young). In addition, current information on the status and distribution of Western Grebe colonies is needed, especially for Alberta. If you have unpublished information on Westerns, Clark's, mixed pairs, and/or intermediates, we would appreciate hearing from you. We will gladly provide information on where or how to search for these grebes. All information or inquiries should be addressed to Eichhorst.

Acknowledgements

Mike Anderson kindly allowed us to camp-out and use the facilities at the Delta Waterfowl and Wetland Research Station. Miles Ward granted permission to work on the East Marsh. The students and staff at the station made our stay most enjoyable. Our field work was funded in part by a Frank M. Chapman award and a University of North Dakota Doctoral Research Fellowship to Bruce Eichhorst.

1. AMERICAN ORNITHOLOGISTS' UNION. 1983. Check-list of North American birds, 6th ed. Washington, D.C., American Ornithologists' Union.

2. ——. 1985. Thirty-fifth Supplement to the American Ornithologists' Union check-list of North American birds. *Auk* 102:680-686.

3. ANDERSON, M.G. and R.E. JONES. 1976. Submerged aquatic vascular plants of East Delta Marsh. Manitoba Dept. Renew. Resour. and Transp. Serv., Wildl. Rep.

4. BAIRD, S.F. 1858. Birds. *In* Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean, vol. 9, part 2. Washington, D.C., Ex. Doc. No. 91.

5. DE SMET, K.D. 1987. First nesting record and status of the Clark's Grebe in Canada. *Blue Jay* 45:101-105.

6. FOOTE, A.L. 1989. Response of nesting waterfowl to flooding in Great Salt Lake wetlands. *Great Basin Naturalist* 49:614-617.

7. GOLLOP, B. 1987. Prairie Provinces region. *Am. Birds* 41:1451-1453.

8. ——. 1988. Prairie Provinces region. *Am. Birds* 42:1304-1305.

9. ——. 1989. Prairie Provinces region. *Am. Birds* 43:1330-1332.

10. KOES, R.F. and P. TAYLOR. 1990. Prairie Provinces region. *Am. Birds* 44:1148-1149.

11. NUECHTERLEIN, G.L. 1975. Nesting ecology of Western Grebes on the Delta Marsh, Manitoba. Unpubl. M.S. thesis, Colorado State Univ., Fort Collins, Colorado.

12. ——. 1982. Western Grebes, the birds that walk on water. *Nat. Geogr.* 161:624-637.

13. SZAFRANSKI, K. 1989. Photo contest. *Nat. Wildl.* 27(1):50-51.

14. WALKER, J.M. 1965. Vegetation changes with falling water levels in the Delta Marsh, Manitoba. Unpubl. Ph.D. thesis, Univ. of Manitoba, Winnipeg, Manitoba.

And I brought you into a plentiful country, to eat the fruit thereof and the goodness thereof; but when ye entered, ye defiled my land, and made mine heritage an abomination. *Jeremiah 2:7 (Peter Matthiesseon. 1959. Wildlife in America. Title Page)*

******

There is not so contemptible a plant or animal that does not confound the most enlarged understanding. *John Locke.*

SAP FOR SURVIVAL

DONALD F. HOOPER, Box 40, Somme, Saskatchewan. S0E 1N0

The storm that came on the night of 30 April and continued most of the morning on 1 May dumped about 14 cm of snow in the Somme district. This made quite a hardship for the many species of insect-eating birds back from their winter homes in the south.

On the morning of 2 May there were many birds around the Manitoba Maples at the end of the garden where there was a patch of bare ground under the shelter of the spreading limbs. Several robins and Rusty Blackbirds were gathered together and Fox Sparrows were scratching back the leaves to uncover insects. A Hermit Thrush pulled out a large earthworm.

A male Yellow-rumped Warbler flitted through the maple branches close to the bottom of the trees. It would flush small moths from the tips of the branches out into the snow and catch them as they were paralysed by the cold. He then went to a Yellow-bellied Sapsucker hole in the bark of a maple trunk and fed on the sap. The sapsucker kept very busy chasing the warbler which returned again and again to the same hole to rob the sweet contents. The sap run was in several trees and the woodpecker went from tree to tree to feed on the sap as the holes filled up.

It is interesting to see a warbler feed on sap as a supplement because of a shortage of insects after a snowstorm. This probably happens more than we think for on 4 May a neighbour of mine saw a Yellow-rumped Warbler and a junco feeding on maple sap that was flowing from a crotch in a branch.

A Yellow-rumped Warbler feeding on sap. *Donald F. Hooper*

ADDITIONS TO THE MANITOBA BIRD LIST (1985-1990)

RUDOLPH F. KOES, 135 Rossmere Crescent, Winnipeg, Manitoba. R2K 0G1

Since 1984, when the last compilation of species new to the known Manitoba avifauna was completed, several species have been added to the provincial list.[26] In some cases these species had never before been reported in the province, while in other instances documentation was received which allowed species to be moved from the hypothetical list to the confirmed list. Confirmed records are those for which material evidence in the form of a specimen, photograph or sound recording exists, or well-documented sight records made by two or more competent observers.

The following is a list of 20 species new to the province. All records were reviewed by the Manitoba Ornithological Records Committee (MORC) (presently H.W.R. Copland, Chair; R.F. Koes, R.W. Nero, and P. Taylor). Seven of these (Yellow-billed Loon, Glossy Ibis, White-faced Ibis, Black-legged Kittiwake, Blue-grey Gnatcatcher, Northern Wheatear and Brewer's Sparrow) were previously on the hypothetical list and have since been confirmed. Six confirmed species had not been reported prior to 1985; one is the result of a "split," while another six species were added to the hypothetical list. All accepted species are indicated by an asterisk (*). The author would appreciate being informed of any missing, incomplete or incorrect information in this list.

* **Yellow-billed Loon**. All observations in Manitoba of this large loon have occurred at Churchill. A bird sighted on 19 June 1981 by B. Aike, Kenn Kaufman, Doug McRae, and others has since been accepted by MORC.[10] On 28 May 1985, Michel Masse and Dwight Cargill saw one at the mouth of the Churchill River, and two there on 29 May. These dates were incorrectly reported as 3 and 4 June in *American Birds*.[20] Sightings on 26 June 1980 and 9 June 1987 lack documentation.[9,14]

Considering the proximity of the Yellow-billed Loon's breeding range to Manitoba, it is perhaps surprising that observations are not more frequent. Godfrey explains however that "Migration ... apparently is mostly coastwise around northern Alaska. ..." and not south through Manitoba.[8]

* **Clark's Grebe**. The occurrence of Clark's Grebe was known in the 19th century. Ernest Thompson Seton makes mention of it in *The Birds of Manitoba*, published in 1891.[38] Only in 1985, though, has it been restored to full species status.[2]

Gary Nuechterlein noted about five birds, plus several hybrids, over a period of seven years during his studies at Delta Marsh (pers. comm.). This was before the bird received species status.

The first confirmed record of the Clark's Grebe since the split was an adult at Natalie Lake near Seven Sisters Falls on 3 May 1986, seen by a Manitoba Naturalists Society birding party.[12] Nuechterlein observed a mated pair at Delta during mid-June 1986.[7] During that same summer Ken De Smet found the first nest for Manitoba – and Canada – at Pelican Lake.[7] Since that time the species has been reported annually in the province, although it is clearly greatly outnumbered here by Western Grebes. The most interesting report involved six birds seen with 25 Western Grebes at Clear Lake, Riding Mountain National Park, on 29 May 1990 by Dan Weedon, Stu Tingely, and a Wings birding tour (Manitoba Bird Record Card system).

* **Northern Gannet**. A Northern Gannet was one of the first birds seen by Simon Perkins and a Massachusetts Audubon Society tour group during a 1989 visit to Cape Merry, Churchill.[18] Field notes and a sketch made at the time – the morning of 17 June – clearly identify it as an adult. Eight other observers shared what must have been a highlight of the trip. The visit of this East Coast bird to the southern reaches of Hudson Bay was not unprecedented; one was seen on 29 October 1981 near Moosonee on James Bay, Ontario.[19]

* **Glossy Ibis**. Of the half dozen or so ibis sightings in the province up to 1989, at least two were reputed to have involved the Glossy Ibis. Neither one was well described; a 1934 report is particularly suspect.[33]

On 24 May 1989, Martin Siepman discovered an adult in the southeast corner of Oak Hammock Marsh Wildlife Management Area (WMA). The bird was last seen on 26 May in the same general area of the marsh.[17] No photographs were obtained, but at least three observers saw it well enough to separate it from the similar White-faced Ibis. Diagnostic green legs with red "knees" were noted, as well as the distinctive face pattern.

* **White-faced Ibis**. From 2 to 6 May 1990 an adult was present at the north end of Oak Hammock Marsh WMA. It proved more cooperative than the Glossy Ibis mentioned above, and, after its discovery by Bill May, was seen at close range by most observers who looked for it. Several diagnostic photographs were taken; one appeared in *American Birds*.[3,28]

Sightings at St. Ambroise on 18 and 31 May 1975 and at Oak Hammock Marsh WMA on 26 May 1975 and 6 August 1977 were ascribed to this species, but none fitted MORC's criteria for confirmed status.[36]

Mute Swan. On a number of occasions Mute Swans have been seen in the wild in Manitoba. One such bird was seen – but not counted! – by Dennis Fast, Gord Grieef, Peter Taylor, and the author during a "Big Day" effort on 27 May 1989 at Oak Hammock Marsh WMA. It was still present on 31 May (MORC files). A check with the few possible sources within the province revealed it had not escaped from a local collection. It is possible that the bird had migrated with Tundra Swans from the Great Lakes, where a feral population of Mute Swans exists, or that it originated at a collection in one of the nearby states. Mute Swans that have reached Manitoba at other times probably arrived here in a similar fashion.

While the 1989 sighting was well documented and was accepted by MORC, the status of the species as a true vagrant in Manitoba is still much in question.

Black Rail. A bird which was flushed from tall grass and was seen briefly as it fluttered away from I.M. Gardner at Oak Hammock Marsh WMA, on 22 May 1989, may have been a Black Rail.[17] Few details could be noted during the short observation period, precluding positive identification. The presence of this diminutive rail in Manitoba must remain hypothetical.

Black-tailed Gull. While on a survey trip aboard a fishing vessel studying colonial water birds in the summer of 1987, Richard Knapton discovered what he subsequently believed to be a Black-tailed Gull. The gull was seen for about 15 minutes on the afternoon of 2 June, as it followed the vessel near Coleman

Island, Sagemace Bay, Lake Winnipegosis. Detailed notes were taken and the account was subsequently published in *Blue Jay*. Unfortunately, its presence could not be confirmed by other birders.[25]

This eastern Asiatic species had previously been reported from the western Aleutians, southern California, and Maryland, but not from Canada.[25]

* **Black-legged Kittiwake**. During a 9 October 1986 MORC meeting an 18 July observation of a Black-legged Kittiwake at Churchill was accepted as confirmed.[11] Details are still lacking on a 1980 sighting, which also took place at Churchill.[9] It is likely that more kittiwakes will turn up in Manitoba; the first inland sighting in the province is long overdue.

Greater Roadrunner. Bill Thiessen reported seeing a roadrunner run across his property near Poplar Point on 22 April 1989.[17] His verbal description of the event was fairly convincing. A subsequent extensive search of the area by numerous birders failed to locate the bird. If the identification was indeed correct, it undoubtedly involved an escaped pet, as roadrunners are sedentary and do not occur closer to Manitoba than southern Kansas.[1,6]

* **Scrub Jay**. Manitoba's first – and Canada's second – record came from Fisher Branch in the Interlake area about 115 km north of Winnipeg.[17,23] From about 6 December 1988 until about 8 February 1989 a Scrub Jay visited the feeder of Dianne Gard of that community. Photographs taken by conservation officer Gerry Rosset clearly identify it as belonging to one of the interior races, which range as far north as southern Idaho and Wyoming.[1] By the time the Manitoba birding community got word of the jay, it had long since disappeared and the birders were much chagrined not to be able to add the species to their lists.

* **Blue-grey Gnatcatcher**. Since the status of the Blue-grey Gnatcatcher in Manitoba was described in 1990, additional written documentation on the 31 August 1982 Kleefleld sighting has enabled MORC to include the species on the Manitoba list.[26]

Blue-grey Gnatcatchers have recently been reported for the first time from Saskatchewan, while North Dakota had its fifth record in the spring of 1990.[30,32]

* **Northern Wheatear.** Although wheatears have been reported at least ten times in Manitoba since 1968, no properly documented sightings by two or more experienced observers were known to us.[5,16,34,39] Birds seen at Churchill in May 1988 were reported as the first confirmed records for the Prairie Province region in *American Birds*, but, again, we have not seen the evidence.[15]

Recently MORC received acceptable documentation on two observations made in 1982 and 1990. A Northern Wheatear seen at Bird Cove near Churchill on 24 June 1982 by Warren Bielenberg and Richard Verch was well described and sketched. Another was located 9 June 1990 by a tour group led by Kim Eckert, also at Churchill. It was believed to have been a first spring male of the western race and it was photographed by Bob Williams of Florida (copy in MORC files).

Yellow Wagtail. The La Perouse Bay area of northern Manitoba is best known for its large Snow Goose colony. While researchers and students at the site have found a number of rarities over the years, the most unusual vagrant to date must have been a Yellow Wagtail, seen on 2 May 1988 by R.J. Hughes and M.D. Carter. Unfortunately, their written report was not detailed enough to positively establish the identity of the bird.

* **Blue-winged Warbler.** Until recently Manitoba had lagged behind Saskatchewan in adding a number of southeastern wood warblers to its avifauna. In the last four years we have fortunately caught up and are now on more equal footing.

Keith Hobson found a misguided Blue-winged Warbler at Delta on 7 November 1987, well after all warblers have usually left for warmer climes. It foraged on or near the leafy forest floor; a brilliant spark in subdued surroundings. A number of birders managed to see it on 8 November. Hobson also photographed it.[2]

* **Yellow-throated Warbler.** The Delta Marsh beach ridge at the south end of Lake Manitoba has produced more than its share of rare bird sightings. This is partially explained by its location, which concentrates migrants along the lakeshore, but is also due to the presence of knowledgeable staff and students at its two research facilities, the University of Manitoba Marsh Field Station and the Delta Waterfowl Research Station. The first Blue-winged, Yellow-throated and Prothonotary Warblers for the province were seen in this area.

On 23 May 1987 Roger Titman discovered a Yellow-throated Warbler in beach-ridge forest just east of the field station. It was seen the same day by Spencer Sealy and Percy N. Hebert, but subsequent searches failed to locate it.[13] The author remembers dragging his family out half a day after completing a gruelling – but successful – “Big Day” to search for the vagrant. We did not find the warbler, but a Glaucous Gull catching insects on the wing with Franklin’s Gulls was a fine consolation.

A more cooperative bird was present from 20 to 25 June 1990 at the Oak Lake resort, where it sang from mature oak/elm woods. It had been found by David Hatch and Martin Siepman and was seen by numerous birders. Gord Grieef obtained a few diagnostic photographs.[29]

* **Prairie Warbler.** The second of two rare warblers found by David Hatch in the summer of 1990, a Prairie Warbler, made the second-growth of an old burn in the boreal forest at Whirlpool Lake, Riding Mountain National Park, its home from 3 July to at least 10 July. Peter Taylor took a number of excellent photographs.[4,29]

While the warbler initially sang vigorously, it was less enthusiastic later on. On at least two dates it was heard to sing perfect – albeit muted – renditions of the Black-throated Warbler’s song, and on one of these occasions (10 July) it was accompanied for some time by a female of that species.

This represents the first record for the species from the Prairie Provinces.

Prothonotary Warbler. Another one of the spectacular wood warblers first found in Manitoba at Delta is the Prothonotary Warbler. On the evening of 17 May 1989 Spencer Sealy saw a bird immediately east of the University of Manitoba Field Station. Others could not find it in the early morning of 18 May. MORC is awaiting written details on this sighting.[17]

The second observation involved a male seen on 31 July 1990 at Birch Point on Buffalo Bay, Lake of the Woods, in the extreme southeast corner of the province. Martin Siepman was the lucky observer.[29]

* **Brewer’s Sparrow.** While conducting a birding tour in the famed Douglas Marsh near Brandon on 2 July 1988, Calvin Cuthbert heard an unfamiliar song. The Douglas Marsh is renowned for its Yellow Rails and Le Conte’s Sparrows, but for the next few days these were all but forgotten and a soggy path was beaten to the songster’s

territory by many members of Manitoba's birding fraternity. The bird was a Brewer's Sparrow, one of the plainest birds of the plains; a sparrow of western sagebrush with a pleasant song, reminiscent at times of a Vesper Sparrow or a canary. It was last noted on 10 July, not 7 July as reported in *American Birds.*[16]

An unconfirmed 1982 sighting at Churchill has been discussed previously.[26]

* **Eurasian Tree Sparrow.** From 2 November 1986 to 22 January 1991 a Eurasian Tree Sparrow made the yard of Helen and James Owen in St. Francois Xavier, just west of Winnipeg, its home.[21,27,31] It arrived on the eve of a wicked fall blizzard, found a well-stocked feeder and stayed for the next four years. In the summer of 1989 it was observed feeding young sparrows, whose ancestry was not established. During summer 1990 and the following winter three obvious Eurasian Tree Sparrow/House Sparrow Hybrids were seen and photographed.[31] Further, Anthony Lang, a University of Toronto Ph. D. candidate studying the species, banded all three hybrids in the spring of 1991.

As there was no evidence to support prior captivity or man-assisted transport of the parent bird, it was accepted as a first Manitoba record. Similarly, in the summer of 1990 the species was added to the Minnesota list.[24,37]

A number of other species, including Swan Goose and Egyptian Goose, have been reported in the wild recently, but as these birds are not native to North America and are commonly kept in collections, they were considered to be escapees. Finally, the sighting of an Acadian Flycatcher on 10 June 1985 has been rejected by MORC.

Bird record committees continue to face difficulties in their task. Roberson recently wrote an informative article on such committee and he stated: "The majority of U.S. committees listed 'lack of observer cooperation' and 'lack of adequate documentation' as their most significant concerns."[35] Our situation is certainly no different; even some of our most active birders rarely or never provide documentation of their sightings. Observers visiting Churchill could facilitate MORC's job, as many observations of rarities in the area remain undocumented. Please forward reports of sightings to MORC, c/o Herb Copland, Manitoba Museum of Man and Nature, 190 Rupert Avenue, Winnipeg, Manitoba, R3B 0N2. As an added incentive, it should be mentioned that the Manitoba Avian Research Committee is presently working on *The Birds of Manitoba* and would like to include as many valid records as possible.

Acknowledgements

Herbert W. R. Copland has been most helpful in providing information about records in the Manitoba Museum of Man and Nature. Peter Taylor's comments and suggestions have greatly improved the manuscript. Many thanks also go to the observers who have taken the time to provide us with documentation.

1. AMERICAN ORNITHOLOGISTS' UNION. 1983. American Ornithologists's Union check-list of North American birds. Sixth edition, American Ornithologists' Union. 877 pp.

2. ——. 1985. Thirty-fifth supplement to the American Ornithologists's Union check-list of North American birds. *Auk* 102:680-686.

3. ANONYMOUS. 1990. Regional Pictorial highlights spring 1990. *Am. Birds* 44:378-380.

4. ——. 1990. Pictorial highlights summer 1990. *Am. Birds* 44:1210-1213.

5. CUMMING, E.E. 1988. Northern Wheatears sighted in Duck Mountain Provincial Park, Manitoba. *Blue Jay* 46:84-85.

6. DESANTE, D. and P. PYLE. 1986.

Distributional checklist of North American birds. Volume 1: United States and Canada. Artemesia Press, Lee Vining, CA. 442 pp.

7. DE SMET, K.D. 1987. First nesting record and status of the Clark's Grebe in Canada. *Blue Jay* 45:101-105.

8. GODFREY, W.E. 1986. The birds of Canada. revised edition. Natl. Mus, Nat. Sci., Ottawa. 595 pp.

9. GOLLOP, J.B. 1980. The nesting season: Prairie Provinces region. *Am. Birds* 34:905-906.

10. ——. 1981. The nesting season: Prairie Provinces region. *Am. Birds* 35:950-952.

11. ——. 1982. The nesting season: Prairie Provinces region. *Am. Birds* 36:988-990.

12. ——. 1986. The spring migration: Prairie Provinces region. *Am. Birds* 40:487-488.

13. ——. 1987. The spring migration: Prairie Provinces region. *Am. Birds* 40:448-450.

14. ——. 1987. The nesting season: Prairie Provinces region. *Am. Birds* 41:1451-1453.

15. ——. 1988. The spring migration: Prairie Provinces region. *Am. Birds* 42:450-451.

16. ——. 1988. The nesting season: Prairie Provinces region. *Am. Birds* 42:1304-1305.

17. ——. 1989. The spring migration: Prairie Provinces region. *Am. Birds* 43:495-497.

18. ——. 1989. The nesting season: Prairie Provinces region. *Am. Birds* 43:1330-1332.

19. GOODWIN, C.E. 1982. The Autumn migration: Ontario region. *Am. Birds* 36:171-174.

20. HARRIS, W.C. 1985. The nesting season: Prairie Provinces region. *Am. Birds* 39:927-928.

21. ——. 1987. The autumn migration: Prairie Provinces region. *Am. Birds* 41:104-106.

22. HOBSON, K.A. 1988. First record of the Blue-winged Warbler in Manitoba. *Blue Jay* 46:86-87.

23. HUNN, E.S. and P.W. MATTOCKS. 1982. The autumn migration: Northern Pacific Coast region. *Am. Birds* 36:208-211.

24. JANSSEN, R.B. and P. SVINGEN. 1990. A Eurasian Tree Sparrow in Minnesota. *Loon* 62:175-177.

25. KNAPTON, R.W. 1990. Black-tailed Gull in southern Manitoba. *Blue Jay* 48:37-38.

26. KOES, R.F. 1985. Additions to the Manitoba bird list (1975-1984). *Blue Jay* 43:224-231.

27. ——. 1988. Eurasian Tree Sparrow in Manitoba. *Blue Jay* 46:34-35.

28. KOES, R.F. and P. TAYLOR. 1990. The spring season: Prairie Provinces region. *Am. Birds* 44:445-447.

29. ——. 1990. The nesting season: Prairie Provinces region. *Am. Birds* 44: 1148-1149.

30. ——. 1991. The autumn migration: Prairie Provinces region. *Am. Birds* 45:118-120.

31. ——. 1991. The winter season: Prairie Provinces region. *Am. Birds* 45:287-288.

32. LAMBETH, D.O. 1990. The spring season: Northern Great Plains region. *Am. Birds* 44:447-450.

33. LAWRENCE, A.G. 1934. Tropical bird at St. Laurent? *Chickadee Notes* 707, Winnipeg Free Press, 12 October 1934.

34. LITTLEFIELD, C.D. 1970. Wheatear observations near Fort Churchill, Manitoba. *Can. Field-Nat.* 84:404-405.

35. ROBERSON, D. 1990. North American bird records committees. *Birding* 22:276-285.

36. SERR, E.M. 1975. The spring migration: Northern Great Plains. *Am. Birds* 29: 867-870.

37. TESSEN, D.D. 1990. The nesting season: Western Great Lakes region. *Am. Birds* 44: 1135-1137.

38. THOMPSON, E.E. 1891. The birds of Manitoba. Proceedings U.S. National Museum 13:457-643.

39. WEDGWOOD, J. 1982. The spring migration: Prairie Provinces region. *Am. Birds* 36:864-866.

GREAT GRAY OWL AND NORTHERN HAWK OWL NESTS AT CHURCHILL, MANITOBA

ANTHONY L. LANG, Department of Zoology, University of Toronto, Toronto, Ontario. M5S 1A1; JAMES R. DUNCAN, Zoology Department, University of Manitoba, Winnipeg, Manitoba. R3T 2N2; SCOTT RAMSAY, 52 Homefield Square, Courtice, Ontario. L1E 1K8; and JAMES D. RISING, Department of Zoology, University of Toronto, Toronto, Ontario. M5S 1A1

The avifauna of the Churchill region in Manitoba has become increasingly well known in recent years.[13] Suetin added to this knowledge when he reported the first two nests of the Northern Hawk Owl to be found at Churchill in 1989. Here we report on the discovery of an active Great Gray Owl nest at Churchill in 1990 and on observations made at the nest. This is the first nest to be found at Churchill (Herbert Copland pers. comm.) and the most northerly nesting record for this species in Manitoba.[9] We also report on observations made at a Northern Hawk Owl nest at Churchill in 1990.

While the University of Toronto Field Ornithology course was being conducted out of the Churchill Northern Studies Centre, adult Northern Hawk Owls were observed in an area of relatively dry

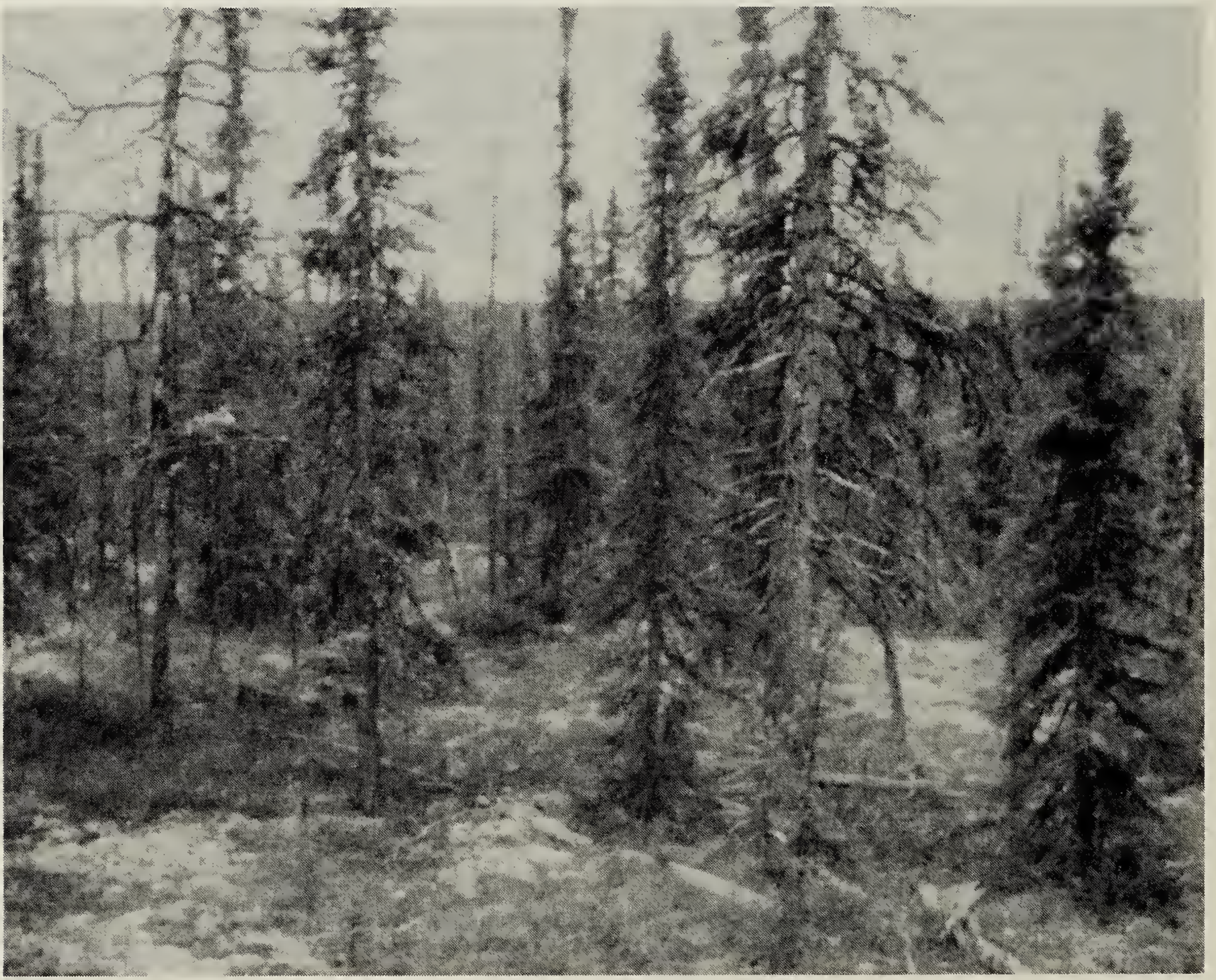


Figure 1. Female Great Gray Owl on nest at Churchill, Manitoba. *Anthony Lang*

taiga on a gravel kame beginning on 7 June 1990. A Great Gray Owl was spotted in the area on 10 June. On 11 June participants in the course heard a *whoop* call given in the same area early in the morning. Later the same morning we saw two adult Great Gray Owls, one with a rodent in its bill. During a search of this area on 13 June, Rising found a Great Gray Owl sitting on a nest. Later the same afternoon, Lang found an active Northern Hawk Owl nest approximately 200 m away. These nests were located on the Twin Lakes kame, about 18 km east and 6 km south of Churchill.

Great Gray Owl Nest

The Great Gray Owl nest was 2.3 m up in a 10 m tall dead tamarack. It was situated on a horizontal branch adjacent to the trunk (Fig. 1). The nest, judging from its size, was probably originally built by either Common Ravens or Northern Goshawks, since Great Gray Owls do not build their own nests.[7,8] The nest tree was located on the edge of the kame where it sloped down to the adjacent wet taiga (Fig. 2). The kame itself rose approximately 15 m above the wet taiga. The habitat on the kame consisted of open forest: white spruce (*Picea glauca*), tamarack (*Larix laricina*), and some black spruce (*P. mariana*) averaging 10 m in height with an understorey of reindeer moss (*Cladonia* spp.) and Labrador tea (*Ledum* sp.). The wet taiga consisted of boggy habitat with black spruce of about 8 m and mosses. About 200 m southeast of the nest was an alder (*Alnus* sp.) bog. The remains of a long dead adult Great Gray Owl, consisting primarily of feathers, were found about 75 m northeast of the nest. However, two adults were later seen in the vicinity of the nest.

The *whoop* call, referred to earlier, is a food demand call given by breeding female Great Gray Owls.[1] It was heard

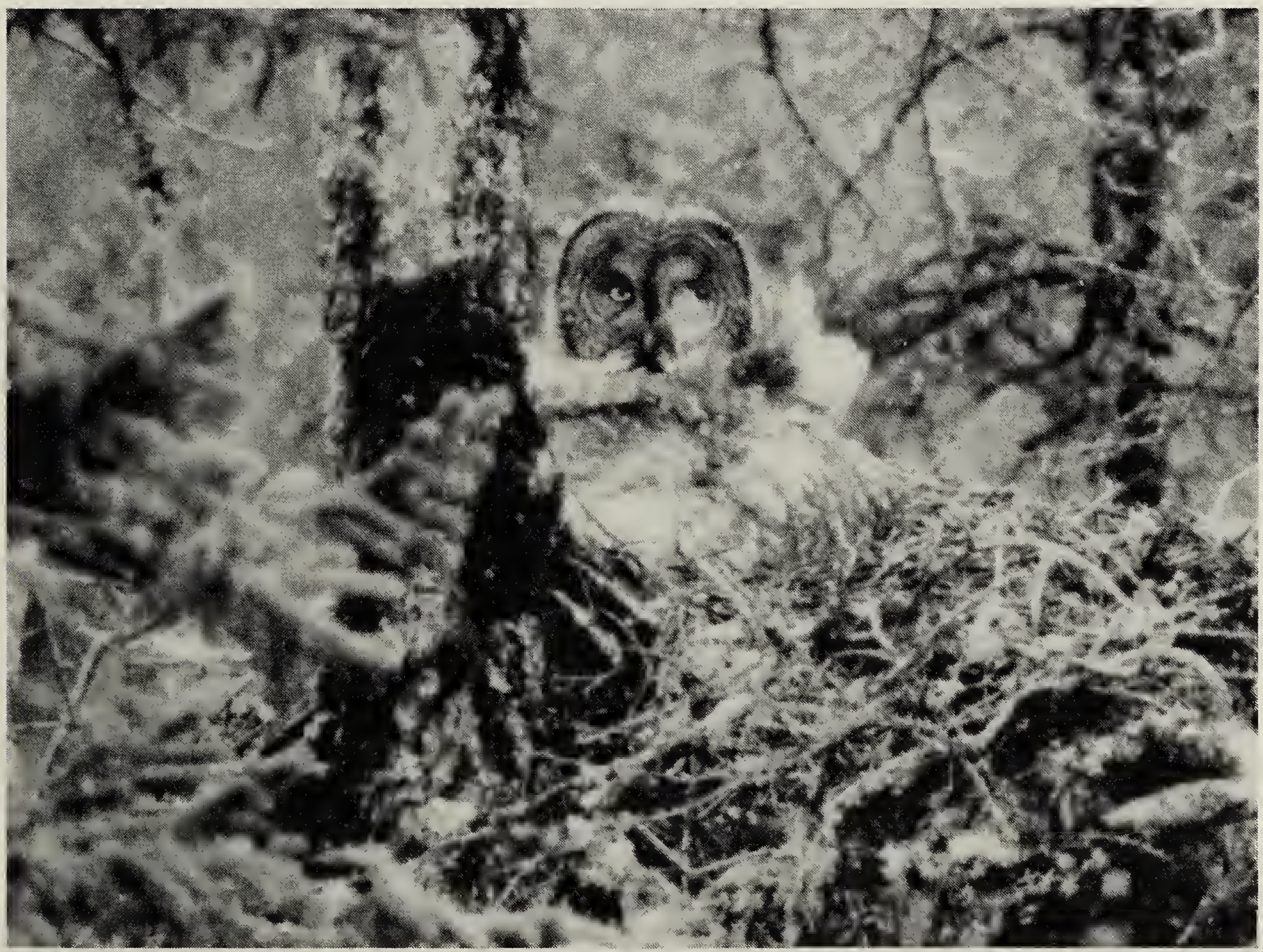


Figure 2. Habitat at the 1990 Churchill Great Gray Owl nest. The nest and young are visible in a snag on the left side of the picture. *Anthony Lang*

on other occasions. By 16 June, when the nest was next observed, the female (assuming that the brooding adult was the female) was no longer continuously brooding the three nestlings. At 0615 h the adult female was observed near the nest giving the *whoop* call every 10 to 15 seconds while the other adult (probably the male) was visible in the distance. That same evening, the female was near the nest and *whoop*-ed rapidly and loudly as the male flew in quickly with a rodent. The nest was last checked on 18 June, when the three large young had body and flight feathers pushing through the down and an adult was spotted 10 m away (Fig. 3). The young were estimated to be from two to three weeks old.

Nine pellets, and fragments of numerous other pellets, were collected from the vicinity of the nest on 12 July 1990 by Duncan. The number of prey items/pellet was 3.67 (range=1-8, standard deviation=2.12). Heather voles were easily the most numerous prey item (Fig. 4), but three other species were also recorded. Smith and Foster observed that some avian predator species seemed to prey disproportionately upon heather voles at Churchill.[12] They suggested that heather voles are more vulnerable due to their bold nature. However, piles of debarked twigs of uniform length left by heather voles were very numerous throughout the area. This suggests that heather voles were abundant and that the owls may have been preying on them in proportion to their abundance. Members of the subfamily Microtinae (voles) made up 86.5% of the diet of Great Gray Owls in the breeding season in Fenno-Scandia and the USSR.[3]

The previous most northerly known nests of the Great Gray Owl in Manitoba were found at Wabowden, some 500 km to the southwest.[9] However, in 1989, Duncan found a pair of Great Gray Owls

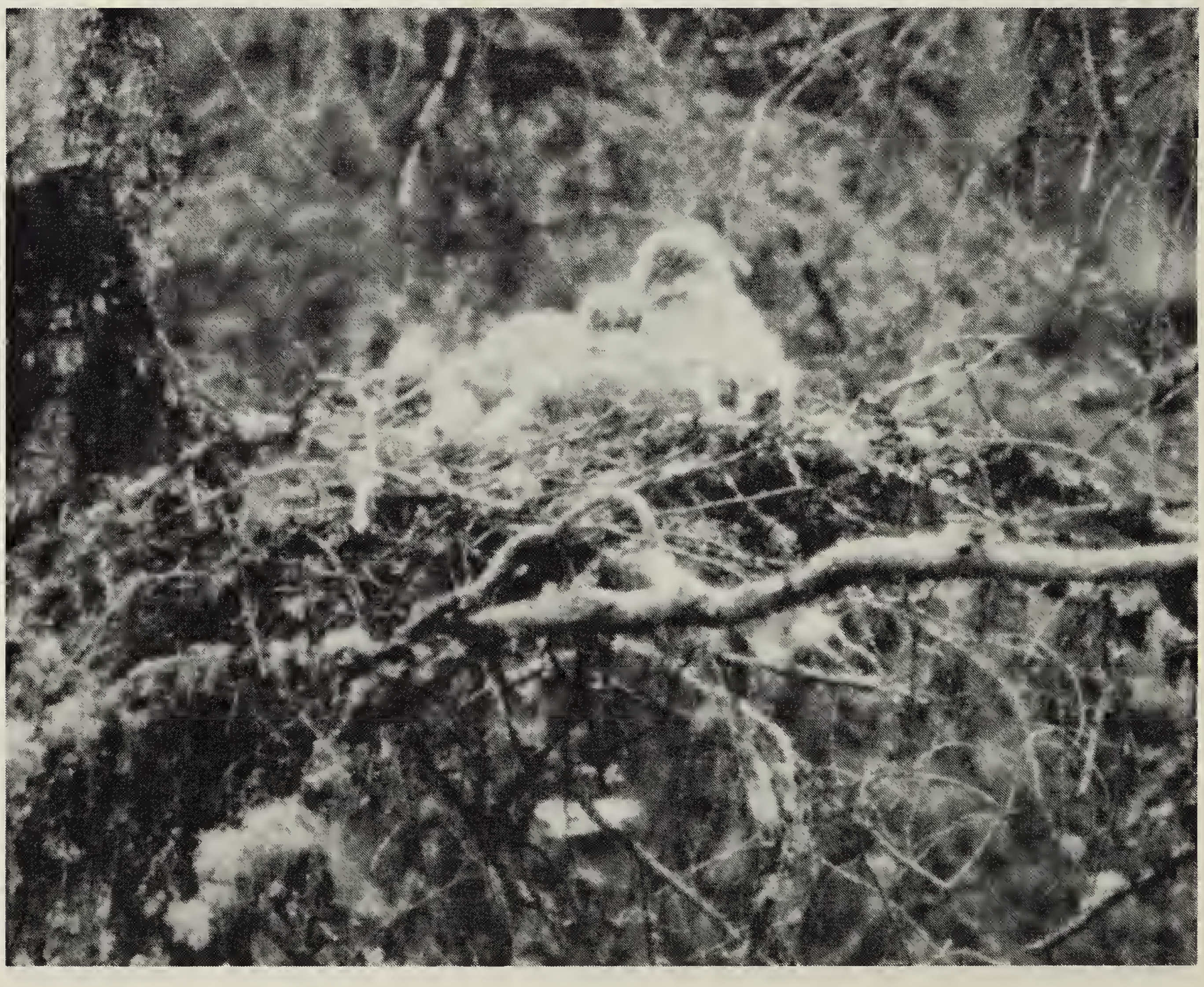


Figure 3. Great Gray Owlets in the Churchill nest. *Anthony Lang*

nesting near White Goose Lake, 400 km to the southeast (unpubl. data). A Great Gray Owl was sighted near the town of Churchill on 18 June 1949 and another was seen at La Perouse Bay, further east along Hudson Bay on 4 June 1972, both in tundra.[2,5] Nero et al. predicted that there was appropriate Great Gray Owl nesting habitat in the northern transition forest that lies between the northern coniferous forest and tundra.[9] This species has nested in similar habitat near Moosenee, Ontario.[9] We feel the lack of summer sightings and nest records from the area between Wabowden and Churchill is probably partly due to the lack of observers. However, the amount of the grassy meadow habitat that supports voles, which are the Great Gray Owl's prey, as well as the number of nest sites, may be limited on the Precambrian Shield.[9]

Northern Hawk Owl Nest

The Northern Hawk Owl nest was found about 200 m northeast of the Great Gray Owl nest. It was within the broken off top of a 5 m tall dead spruce tree (Fig. 5). Three nestlings were visible when the nest was found. Two larger nestlings were more visible than the third and were approximately 3/4 the size of the adults. They were already covered in juvenal plumage. The nest tree was on the kame (see habitat description above) and was about 5 m west of a pond that measured roughly 300 m by 75 m. Fifty m to the south of the nest was a stand of balsam poplar (*Populus balsamifera*). It was not known whether either pair of owls excluded the other from its territory. Active nests of Honey Buzzards (*Pernis apivorus*), Sparrow Hawks (*Accipiter nisus*), Short-eared Owls, Ural Owls (*Strix uralensis*), and Great Gray Owls have been found within 500 m of nesting Northern Hawk Owls in Europe.[7] Mikkola considers the last three species direct competitors for food with Northern Hawk Owls. They

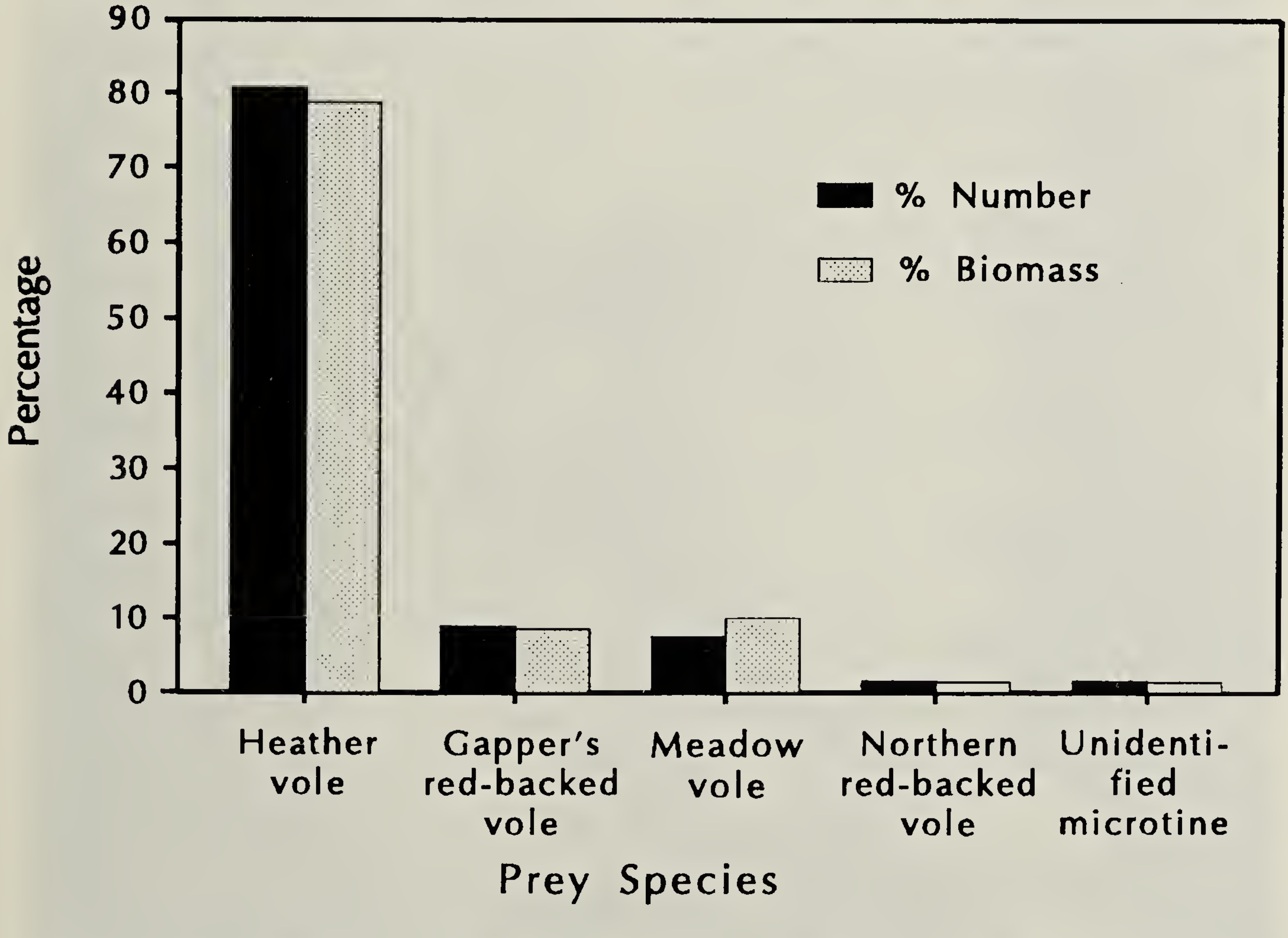


Figure 4. Percent number and biomass of species of prey items (n = 67) found in pellets (n = 9, plus several fragments) at the Churchill Great Gray Owl nest. Mean species weights were: heather vole, 27.9g; Gapper's red-backed vole, 27.4g; meadow vole, 38.4g; northern red-backed vole, 27.4g; unidentified microtine, 27.6g (based on percent of species in sample).

may also hunt at the same times of day.[7] Raymond Tuokko (pers. comm.) observed a Northern Hawk Owl repeatedly attack a female Great Gray Owl, each time she left the nest. On one occasion Tuokko saw the female knocked to the ground. We did not observe aggressive interactions between the two species at the Churchill nest site.

Ramsay observed the nest from a blind for 27.5 h 16-19 June. On 16 June the largest juvenile had left the nest and was perched halfway down the tree. All of the young had some natal down showing. The next largest juvenile left the next day, and the smallest left the day after. Each of the juveniles remained in the nest tree for several hours after leaving the nest. The day after they left the nest, each juvenile had moved a few metres away from the nest tree. None of the young were seen to fly during the observation period. Lane and Duncan observed that young Northern Hawk Owls were able to fly at least 20 m when only 34 days old.[6] This was approximately five to six days after leaving the nest. There has likely been strong selection for rapid flight development, given that the young Northern Hawk Owls are extremely vulnerable at this stage.

The young were fed by the adults while they were in the nest, and while they were perched on trees, fallen logs or the ground. Adults made an average of 2.1 food deliveries per hour to the nest area. Adults delivered food at intervals averaging 48.5 minutes (standard deviation=34.9, n=12 intervals). These intervals ranged from 10 to 130 minutes in length; however, even longer intervals were not included in this analysis because they began or ended with the beginning or termination of an observation period. Observations from the blind did not appear to affect the provisioning of the young, as adults delivered food in as little as five minutes after the blind

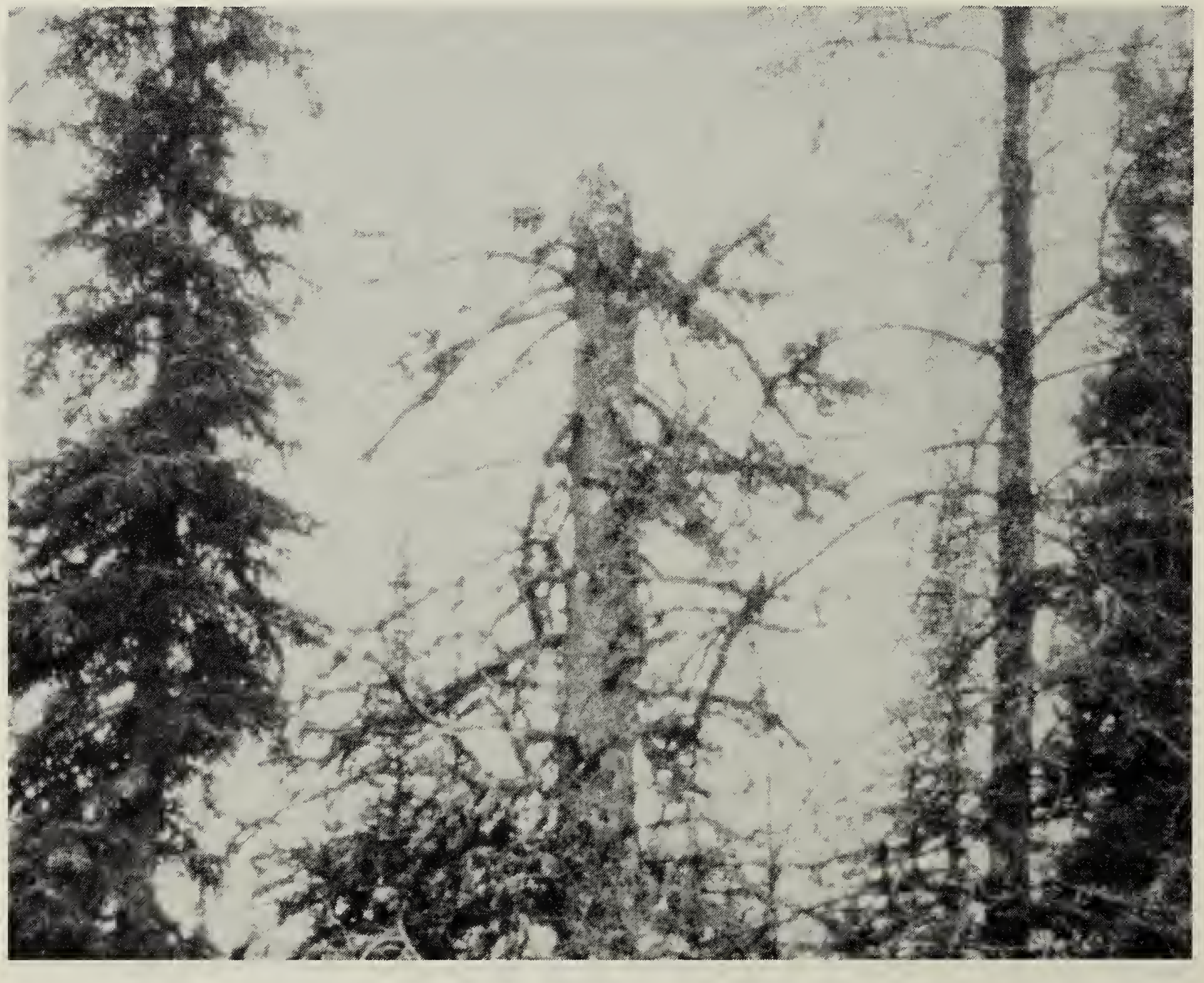


Figure 5. Northern Hawk Owl nest located in the top of a broken off spruce. *Anthony Lang*

was occupied. Ramsay was accompanied on two of the six visits to the blind by another person who promptly left. The longest intervals between food deliveries were recorded shortly after midnight, in the early afternoon, and at mid-afternoon. The two oldest juveniles appeared to be fed less often on their first day out of the nest than on other days, however, feeding was only observed for three days. Adults fed up to two young per trip. In most cases, the sex of the adult could not be determined. The adults appeared to bring food to the young in response to their calls rather than feeding them at will. This agrees with other published observations.[3]

Two pellets were collected from under the nest tree and the contents were identified by Kevin Seymour of the Department of Vertebrate Paleontology of the Royal Ontario Museum. Bones from the pellets are now housed in the collection of that department. One of the pellets contained the remains of two red-backed voles (ROM R2719). There was insufficient material to determine whether the remains were from Gapper's or Northern Red-backed Voles. Bones in the other pellet were identified as belonging to two northern bog lemmings (ROM R2717) and one heather vole (ROM R2718). In Norway, Finland, and the USSR, rodents of the subfamily Microtinae made up 75.6 to 96.3% of the prey items in the breeding season diet of hawk owls.[3] Red-backed voles and heather voles were preyed upon by both the Northern Hawk Owls and the closely nesting Great Gray Owls (Fig. 4).

Mikkola considers Great Gray Owls and Northern Hawk Owls competitors for food. The two species may compete only when prey abundance is low.[7] However, both species are thought to be nomadic, settling into areas with high vole abundance. These species may be limited more by nest site availability. Mikkola reports that Great Gray Owls occasionally nest in "loose colonies" in areas with high vole densities.[7] Hagen, in Cramp, estimated European Hawk Owl densities as high as 4 pairs/200 km.[2,3] Therefore, high densities of both of these owl species are possible, perhaps when prey densities are high. Such conditions may have prevailed at the Churchill nest sites, permitting these potential competitors to nest within 200 m of each other. Similar interspecific nesting densities were observed during a cyclic vole peak in burnt forest habitat in northern Minnesota.[4,6]

The hawk owls were observed caching prey. On one occasion, an adult flew from a tree near the nest and landed just below the top of another tree. It then flew out of the tree with prey in its bill and returned to feed the young. One adult habitually perched near the young owlets and was often inactive for long periods of time. On some of its forays for prey it would return almost immediately with prey. Observations that the adult flew off with any uneaten portions of prey items after feeding the young also suggest that the owls may have been caching food. Caching has been previously documented for this species.[10,11] As suggested above, one of the adults was always present at the nest as a sentinel. At a Northern Hawk Owl nest in Minnesota, Lane and Duncan found that after the young fledged, the female stayed to protect them while the male did most of the hunting.[6]

The adults appeared agitated and flew from tree to tree when people were in the vicinity of the young or nest. The adults flew at the heads of people who walked near the nest, at times even striking them, although without using their talons. However, every effort was made to avoid approaching the nest closely, except to occupy the blind. When human intruders were near, the adults gave rasping alarm calls that rose abruptly at the end. These are described and illustrated by sonograms in Cramp and Walker.[3,14] A sample of these calls was tape recorded and the length of the calls was measured from sonograms made from the recordings. The calls varied from 0.5 to 1.45 s in length.

Shorter calls that can be described as *ki-ki-ki* were also given. These calls were given individually or in groups with individual calls separated by approximately 0.2 s. As mentioned above, the young called to be fed. These calls are also described by Cramp and Walker.[3,14] The adult hawk owls tolerated very close approach by people while away from the nest or young. It became apparent that the adults had habituated to the observer near the nest when it was discovered that their behaviour did not change when Ramsay stepped out of the observation blind. Copies of the recordings mentioned above, and of other species tape recorded at Churchill, are housed in the Library of Natural Sounds at the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York, 14850. Interested individuals can request copies of these and other recordings from the Library of Natural Sounds.

On one occasion the alarm calls of the adult owls attracted a male Pine Grosbeak to within 10 m of one adult hawk owl. The grosbeak's crown feathers were erect and it began calling, but the owls ignored it. It was not apparent whether the grosbeak was scolding the owls or joining the owls in mobbing the human intruders. A Bonaparte's Gull flying overhead also elicited an aggressive response, the adult owl becoming more agitated. One of the owls was attacked by a Rusty Blackbird on another occasion.

There are rumours that there were as many as three Northern Hawk Owl nests at Churchill in 1990 (Rudolf Koes pers. comm.). We urge people to report any nesting of these species at Churchill in the future in order that we may learn more about the in status and ecology at the poorly known northern edges of their ranges.

Acknowledgements

We would like to thank Patsy Duncan for help in analyzing the contents of Great Gray Owl pellets; Kevin Seymour, Department of Vertebrate Paleontology, Royal Ontario Museum, for identifying the hawk owl prey items; Jack Dubois, Curator of Mammalogy, Manitoba Museum of Man and Nature, for information about prey species; Paul DiLiddo for his observations from the Great Gray Owl nest; and Alvaro Jaramillo and Professor T.S. Parsons, both of the Department of Zoology, University of Toronto, for reviewing the manuscript.

1. COLLINS, K.M. 1980. Aspects of the biology of the Great Gray Owl. Unpubl. M.Sc. thesis, Univ. of Manitoba, Winnipeg, Manitoba.

2. COOKE, F., A.J. PAKULAK, R.K. ROSS and R.K. SCHMIDT. 1975. Birds of the tundra biome at Cape Churchill and La Perouse Bay. *Can. Field Nat.* 89: 413-422.

3. CRAMP, S. (ed.). 1985. Handbook of the birds of Europe, the Middle East, and North Africa, Vol. IV, Terns to Woodpeckers. Oxford University Press, Oxford.

4. DUNCAN, J.R. and P.A. Lane. 1987. Breeding Boreal Owls in Roseau County. *Loon* 59: 163-165.

5. JEHL. J.R. and B.A. SMITH. 1970. Birds of the Churchill region. Special Publ. No. 1, Manitoba Museum of Man and Nature, Winnipeg.

6. LANE, P.A. and J.R. DUNCAN. 1987. Observations of Northern Hawk-Owls nesting in Roseau County. *Loon*: 165-174.

7. MIKKOLA, H. 1983. Owls of Europe. T & AD Poyser, Calton.

8. NERO, R.W. 1980. The Great Gray Owl, phantom of the northern forest. Smithsonian Institution, Washington, D.C.

9. NERO, R.W., H.W.R. COPLAND and J.MEZIBROSKI.1984. The Great Gray Owl in Manitoba, 1968-83. *Blue Jay* 42: 130-151.

10. RITCHIE, R.J. 1980. Food caching behavior of nesting wild Hawk-Owls. *Raptor Research* 14: 59-60.

11. SIMON, S. and D. SIMON. 1980. Observations sur la reproduction de la Chouette épevière *Surnia ulula*. *Alauda* 48: 152-153.

12. SMITH, D.A. and J.B. FOSTER. 1957. Notes on the small mammals of Churchill Manitoba. *J. Mammal.* 38: 98-115.

13. SUETIN, G. 1990. The Northern Hawk-Owl nesting at Churchill, Manitoba. *Blue Jay* 48: 115-116.

14. WALKER, L.W. 1974. The book of owls. Alfred A. Knopf Inc., New York.

ELK CALF "HIDES" UNDERWATER

WILLIAM J. WALLEY, 222 Bossons Avenue, Dauphin, Manitoba. R7N 0R2

Whitewater Lake is located in the central sector of Riding Mountain National Park, Manitoba. This wilderness lake area, accessible to the public only by foot or non-motorized vehicle, is a mosaic of mixed spruce-poplar forest with dense growths of hazelnut (*Corylus* sp.) and small lowland swamps dominated by sedge (*Carex* sp.). A few open grassy meadows range from 0.5 to about six ha in area. The region is prime habitat for the American Elk (*Cervus elaphus manitobensis*) and is a principal calving locality for the species. A beaver dam at the lake's outlet, built in the mid-1970s, raised the water level causing flooding of the lake's two islands and lowland woods adjacent to the lake. The islands are used by the elk for refuge from predators such as wolves (*Canis lupus*) and bears (*Ursus americanus*). With the park boundary over five km south of the lake, no human habitation exists for a least that distance.

On the morning of 31 May 1975, my party of three was hiking eastward along the shore of a wooded promontory when flood waters forced us to detour inland. As we followed the edge of these waters southward, we found an elk calf, estimated to be only a few days old, beside a shrub less than .25 m from the water. After a few seconds, it suddenly lunged forward bleating and dropped into the calm, clear water about six m away. Its head was held above the surface with its back exposed. Anticipating that the cow would respond to the calf's bleats and not wanting to interfere further, we left.

About 20 minutes later, I returned to the site to retrieve an item of equipment. To my amazement, the elk was still in the water, this time with its head submerged and only the top of its back exposed. As I watched, it lifted its head, breathed and resubmerged. The following day, 1 June, the calf was gone. There was no evidence the animal perished or was attacked by a predator. Presumably, it was led off by the cow.

According to L.N. Carbyn, Canadian Wildlife Service (pers. comm.), who is well versed on the life history of the American Elk, this behaviour had not previously been reported. W. B. Preston of the Manitoba Museum of Man and Nature (pers. comm.) relates two similar incidents involving Columbian Blacktail Deer (*Odocoileus hemionus columbianus*) fawns on Vancouver Island in the late 1950s. In one instance, Preston had been chasing a fawn in order to tag it and obtain weight and measurement data. It was running along a logging road and suddenly dropped and "froze." It had happened to land in a roadside ditch full of water and its head was submerged. In the other incident, the fawn happened to drop into a mud puddle on a logging road. Preston points out that when very young, fawns tend to drop and "freeze" where they are, at any sign of danger. When they are older, they may run first and then drop, perhaps after becoming fatigued, he suggests.

Geist makes no mention of elk calves utilizing water in which to hide.[1] However, he stated that if a predator is close, bolting from its hiding place may permit a calf to hide again suddenly, providing it can put a visual barrier between itself and the predator. Could this calf have perceived the water as such a barrier?

It seems highly unlikely that the calf ran toward the water to hide in it. Since its observers were on its west side, it certainly ran away from them eastward which happened to be into the water, where it dropped and froze instinctively, albeit with its head up. The adaptive value of freezing in this situation would obviously be lost by the up and own movement of the animal's head. It is an example of an animal negating the adaptive adaptive advantage of freezing in adjusting to an unnatural element in which to breathe – water.

Acknowledgements

Appreciation is extended to Dr. William B.V. Preston, Manitoba Museum of Man and Nature, Winnipeg, and Dr. L.N. Carbyn, Canadian Wildlife Service, Edmonton, for their remarks and information.

1. GEIST, VALERIUS. 1982. in Thomas, J.W. and D.E. Toweill. Elk of North America ecology and management. Stackpole Books, Harrisburg, Pa. 698 pp.: p. 238.

Elk. *Wayne Lynch*

BIRDER'S GUIDE TO SOUTHWESTERN MANITOBA

C.W. CUTHBERT, J.I. HORTON, M.W. MCCOWAN, B.G. ROBINSON and N.G. SHORT. 1990. Published by authors. 100 pp., illustrated in black and white, maps, photos, drawings. (14 x 21.5 cm) $8.00, paperback. ISBN 0-920436-37-4.

This is a neat book, describing the best birding areas in Manitoba from Riding Mountain National Park to the U.S. border and from Saskatchewan almost to Portage La Prairie. It also provides a checklist of birds, the dates they occur and a monthly indication of abundance. Birders now have site guides for all of southern Manitoba, this one complementing the "Birder's Guide to Southeastern Manitoba."[1]

The introduction describes the landscapes of the region. "When to come" devotes 13 lines to a monthly account of highlights. Birders wanting to know when they might see as many species as possible will appreciate a statement advising that the largest number occurs in May (207 ± uncommon to abundant species) with June, July and August close behind (193-195). There are also sections on where to stay, weather and what to wear, helpful publications (including field guides), and local contacts.

The birding sites begin with four in the city of Brandon – an excellent feature. Maybe the next edition could designate city birds in the "Species List." Four routes out of Brandon and seven country sites follow. Each is described in terms of its habitat, access and a selection of species that may be expected – usually from 25 to 50. There is a map for each area and photographs of eight sites. The maps are excellent, although an area map showing where the 12 regional maps fit in would be helpful to the reader. In spite of a warning about "roads ... without gravel" being impassable when wet, more often than not road surfaces are not specified.

"Specialties of the Region" occupies eight pages and covers 43 species, giving habitats and locations for each. "Specialties" are not defined. They include species that are rare, uncommon and common in the region and some that breed from coast to coast in Canada and into the United States. Had these pages been set up like the rest of the book, more species and other information could have been included.

The "Species List" occupies 19 pages, the first being a legend. This is followed on the left pages by bar graphs for 249 species, showing abundance month by month and breeding status in the area. The facing pages contain brief comments on breeding habitats and locations for some birds and on migration sites for others. In the legend, two categories, "Occasional" and "Accidental," have the same symbol (repeated from the southeastern guide).

The six abundance categories are compiled from a somewhat conflicting set of criteria: relative abundance (e.g., abundant, uncommon) is the primary designation; this is followed by opportunity to see a species (e.g., on all visits, less frequently) and by the number likely to be seen (e.g., often larger, unusually low). Such a system apparently assumes that the opportunities to detect a species varies only with its abundance, regardless of habitat, behaviour, size and colour. This apparently causes problems, e.g., where Ospreys nest, they are likely to be seen on the "majority of visits" ("Common"), even though they are

"Rare" in their "preferred habitat." While Red-eyed Vireos may be detected "on all visits" (abundant), it is difficult to visualize them as "Abundant," as Snow Geese are designated for spring and fall. Likewise, Great Horned Owls are in the same abundance category spring through fall as some ducks, that occur in staging flocks of hundreds.

Source of data do not indicate whether annual population information – Breeding Bird Survey, Christmas Bird Counts, government and Ducks Unlimited surveys of waterfowl and upland game birds – were used in determining relative abundance.

A book encouraging people to look for birds might well have included a code of ethics. Along the same line, users should have been warned of the fragility of some species by noting those that are officially designated (federally and provincially) as endangered, threatened and vulnerable.

The index is a useful addition, partly because it serves as an indirect site directory for species.

The above criticisms are minor compared to the usefulness of the guide. It's the only way to go – to southwestern Manitoba.

1. CLEVELAND, J.N., C.W. CUTHBERT, G.D. GRIEEF, G.E. HOLLAND, P.A. HORCH, R.W. KNAPTON, R.F. KOES, N.F. MURDOCH, W.P. NEILKY and I.A. WARD. 1980. Birder's guide to southeastern Manitoba. Eco Series 1. Manitoba Naturalists Society, Winnipeg, MB. 58 pp.

Reviewed by *Bernie Gollop*, 2202 York Avenue, Saskatoon, Saskatchewan, S7J 1J1

WITH PTARMIGAN AND TUNDRA WOLVES

CY HAMPSON. 1991. Orca Book Publishers, Victoria, British Columbia. 140 pp., 65 photographs (Colour and black and white) $16.95 ppb.

Have you ever yearned to see the birds, mammals and flowers of the Canadian Arctic but feel you cannot make the trip and probably never will? Cy Hampson's new book *With Ptarmigan and Tundra Wolves* will take you there, and to places the most exotic tourist trips will never reach. It contains seven chapters describing the adventures of Cy and his wife, Mary, with Willow Ptarmigan, Grizzly Bears, loons, geese, Tundra Swans, whimbrels and many other plant and animal species on the Anderson River delta of the western Arctic through spring and summer. This is followed by five chapters on the author's adventures with a party of scientists on Bathurst Island. This part contains some marvellous descriptions and photographs of the life cycle of sanderling, Musk Oxen, Arctic Hares, Rock Ptarmigan, as well as vegetation and terrain. Geographically, Bathurst Island is about 15 degrees latitude from the north pole at about 100 degrees west longitude. Readers will find the account of visits of Cy and Mary with naturalists and other friends thoroughly interesting too.

This book is made more readable by the incidental descriptions of sights and sounds of various species or terrain that accompany the main animal or bird under consideration in a particular chapter. For example, here is one of Cy Hampton's observations from Anderson River: "About halfway back, two pale short-eared owls were seen, flapping lazily over the willows with deep, slow wingbeats. One of them drove toward the other nearly brushing its wings, and the soft resonant, closely spaced courtship notes *too-too-too-too-too* drifted back on the stirring north breeze."

Here is a second example about birds. "Both Arctic and red-throated loons flew daily, while slim, buoyant Arctic terns, with their bright red beaks, long slender tapering wings and scissor-like forked tails, perched lightly on bits of bare driftwood or drifted swallow-like overhead." About the sudden Arctic summer here is another example. "Scarlet Arctic rhododendron bloomed in the damper spots among the willows while waxy yellow marsh marigold and handsome clusters of Labrador tea flourished in lower areas with their roots in shallow water. Striking down-clad wooly lousewort extended its compact, bright red flower heads toward the sun, while its closer relative, the Arctic lousewort, was resplendent in shades of pink."

As an example of Cy Hampson's writing about mammals I chose this description of Eeyore, the old muskox dying on the tundra, unassailed by the wolves nearby. "Golden-gray fur covered the hump and middorsal region, the sides were darker brown, the face still darker and the lower legs a bright silver. The lustrous eyes were shades of blue, ringed prominent ridges under our fingertips. The eyes were partially closed except when we touched him. He no longer struggled. He appeared to be failing fast."

And now, a word or two about the arrangement and mechanics of the book. The diction is a pleasure to experience. I had not known of Cy Hampson's earlier graduate work in England, I had only known him as a competent zoologist and gentle naturalist of the great plains and the tundra. There are singularly few typographical errors and spelling mistakes that creep into electronic page preparation in spite of any author. I would find the chapter identification easier to refer to if chapter numbers had accompanied the chapter titles on the first page of each chapter. I believe that the exquisite colour photographs would have been even more useful if separated into plates bound into the pages near where they were treated but such is the price an author pays to the "mechanics of publication."

What a wonderful opportunity this book provides for those who rejoice in the wonders of the natural world. Those who read it will be well rewarded with more knowledge of our planet and its inhabitants.

Reviewed by *Jim Jowsey*, Box 400, Saltcoats, Saskatchewan. S0A 3R0

* * *

How do spiders view frost in their webs? As so much flotsam cluttering the lines? or are they too numb from the cold morning to notice? *Braun and Cavagnaro. 1971. Living Water. American West, Palo Alto, CA.*

ON SITE EDUCATION: A FIRST STEP TO IMPROVED PROTECTION OF ENDANGERED SPACES

PETER JONKER, Extension Division, University of Saskatchewan, Saskatoon, Saskatchewan. S7N 0W0

Editor's Note: the following is adapted from the address Peter gave at the Saskatchewan Natural History Society's 43rd Annual General Meeting in October.

As the title suggests, I am going to highlight the importance of learning within wilderness settings. In addition, I will offer a few remarks about one of my programs entitled, "Encounters with Saskatchewan's Endangered Spaces."

In a nutshell, I am going to make two points:

First, that we are challenged to *re*-attach the human psyche to the biosphere which gave us birth and which continues to bear us day by day.

Flowing from this first point is a second – that on-site education (or on-site learning) is a primary vehicle for meeting that challenge.

People need to become *re*-attached to the biosphere because we live in cultures of gross *de*-tachment. This detachment occurs from the day we draw our first breath of air to the day we expire our last – especially for us citizens of so-called developed, industrialized, technological nations. Detachment in these developed nations is longstanding – chronic. The result of such chronic detachment is a society that is ecologically dysfunctional. To the extent that our detachment is chronic our ecological dysfunctionalism is also chronic; we are all too familiar with that both locally and globally.

To illustrate detachment from our natural environment, I need provide only a few examples. Not long after birth, the baby bottle separates us from the breast; then our houses, attached garages, our cars insulate us from fluctuations in temperature, wind, moisture; our carefully groomed yards, back alleys, and corner sidewalks comprise an unnatural landscape for our young people; the Walkman offers further detachment; the grocery store separates the vegetables we eat from the soils from which we grow them, the animals we eat from the pastures that nourish them, and the butchers who kill them for us. Our water arrives through faucets and disappears through drains. Our roads and bridges insulate us from a richly varied natural topography.

Televisions, videos, and the *National Enquirer* have flourished to fill a vast population of eroded psyches with a new artificial reality where stars perform on stages and wildlife happens when you bring over the beer.

Examples such as these are only symptomatic, however. The actual malady lies deeper than that.

In a sense, and I want to believe this can change, western culture has made a science of detachment. In fact, our scientists, and hence our sciences, have for several centuries prided themselves on being "objective," as is the fondly used term which boils down to meaning that they perceive

Professor Stan Rowe explains landscape ecology of the South Saskatchewan River Valley near Saskatoon. *P. Jonker*

themselves and their disciplines to be apart from and above all those other fields of scholarly study that are too much encumbered by heavy-handed values and philosophies. And, wouldn't you know it, these scientists are perhaps our most venerated social institution.

This is not to implicate science as the only or ultimate driving force behind this mis-direction. The malady lies still deeper.

I suspect our society is ecologically dysfunctional because the majority of its citizens today perceive themselves apart from and above the interaction of forces that characterize the biosphere. I believe that our detachment from the biosphere is ultimately a matter of the human mind.

Martin Heidegger, a venerated German philosopher, has drawn attention to our inclination to engage only in "representational thinking," and to neglect more fundamental soul searching.[1] You can easily recognize thinking as all the thinking you do of things, objects, ideas which appear to exist apart from you. Another level of thinking, the soul searching which he calls "open thinking," occurs when you ponder your very being. Why do I exist? Why does anything exist? Perhaps it would be better if we were to attend regularly to both these levels of thinking.

Words, ideas, language are the first technology to enable representational thinking. Perhaps, and ironically as Mark Meisner recently pointed out, the same evolutionary development of language skill that many proudly believe sets us apart from and above all other organisms, may indeed be the opening act of human/environment apartheid.[2] They are the cells and shackles by which we first imprison and then force the dynamic ecosystem into our human service. They are representational thinking.

So, what should be our best counter response? Our most informed remedy?

Firstly then, we need to be guarded against making the mistake of restricting ecology (or environmentalism, or natural history if you prefer) to the mental realm of scientific concepts. To follow this path would merely support and perpetuate the same representational thinking and associated management posture that needs to take a back seat to genuine reflection on our being.

Having said that, I want to encourage you, and challenge you in turn to en-

Some members of the group guided through the Athabasca Sand Dunes, June 1991: (l. to r.) Adam Kosawan, Courtenay Milne, John Gerrard, Ken Norman, Cliff Matthews, Peter Jonker, Stan Rowe, Thelma Howard.

courage others within your reach, to continue to discover and learn within wilderness settings. It is exciting to see the lively schedule of outings organized throughout the year by members of the Saskatchewan Natural History Society and its many affiliates. This, I believe, is holistic learning; the kind that spawns desperately needed respect and humility. I'm not restricting myself to learning bird identification, because I believe that natural history is much larger than that. I find that books and lectures assist me, but no learning equals that which you feel, and which occurs by being there, sleeping there, walking there. Observing details with your own eyes, smelling changes with your own nose, hearing mornings and evenings and midnights with your own ears; with your own fingers touching decaying bark, seeping earth, drying leaves, cooling stone.

This, I believe, is the eco-centric learning that Stan Rowe referred to in an essay entitled "Wilderness As Home Place":

> "The only firm foundation for wilderness preservation is psychological and attitudinal. ... Eco-centric education, switching the emphasis away from ourselves, is the key."
>
> In the long haul, the preservation of wilderness depends on attitudes; not management attitudes but attitudes born during those times when you lie awake under a myriad of frosty stars and hear the soft chatter of an invisible slipstream of swans winging southward.

***

I have been trying to take this approach to heart. About a year and a half ago, in my capacity as the Coordinator for Environment Science and Technology programs, I asked a group of environmentalist friends to give me some programming direction. One of the programs I initiated as a result of that consultation is entitled "Encounters with Saskatchewan's Endangered Spaces" and I want to tell you a little bit about it.

The essential ingredient of this program is field study. There are numerous programs available throughout Saskatchewan and certainly throughout western Canada that bring people into remote places. But these are by and large

Professor Stan Rowe seated on a wind-exposed lateral root of White Spruce near William River. *P. Jonker*

tourism-driven wilderness adventure trips or "eco-tours." These are field visits. The program I seek, and which I will continue to build upon, is one whose primary focus is field eduction, and whose primary target is interested members of the public. Although the program is fledgling, I have tried to improve it each year.

In keeping with this goal of educating, during the first year I organized one full day of lectures, which was followed by a second long day of field study in the Saskatoon area. Thereafter, the program conducted three overnight trips: one to Cypress Hills, one to Grasslands National Park, and a third to the Athabasca Sand Dunes. The first two of these overnight trips were made in cooperation with the Saskatchewan Natural History Society, and were successfully administered by Stan Shadick. Sixty-six people attended the lectures and the Saskatoon area trip, twenty people attended each of the Cypress and Grasslands trips, and eight attended the Athabasca Sand Dunes field study. As result of the first year's series, and with some financial support from the Saskatchewan Natural History Society and the Canadian Parks and Wilderness Society, we are preparing a book entitled, *Saskatchewan's Endangered Spaces: An Introduction*. It is expected to be printed by March, and will also form a basic reading text for the program from year to year.

Beginning this year, and during future years, Encounters With Saskatchewan's Endangered Spaces will try each year to focus on and highlight a specific region within the province. This year it will be the Churchill River area, and next year it will be the grasslands. Participants will be introduced to local geology, soils, vegetation, and wildlife – and most importantly, how these interact.

I deeply appreciate the support that you as individuals, and the Saskatchewan Natural History Society, have shown for this program.

I invite anyone who is interested in contributing ideas to this program, or who would like to be on the mailing list for a brochure, to contact me at the University of Saskatchewan Extension Division.

1. HEIDEGGER, MARTIN. 1977. Translated by W. Lovitt. The question concerning technology and other essays. Harper and Row Publishers, New York.
2. MEISNER, MARK. 1991. Words and worlds: language and the perceived separation of humans from nature. *Undercurrents* 3:3-11.

SOCIETY NEWS

Cliff Shaw Award

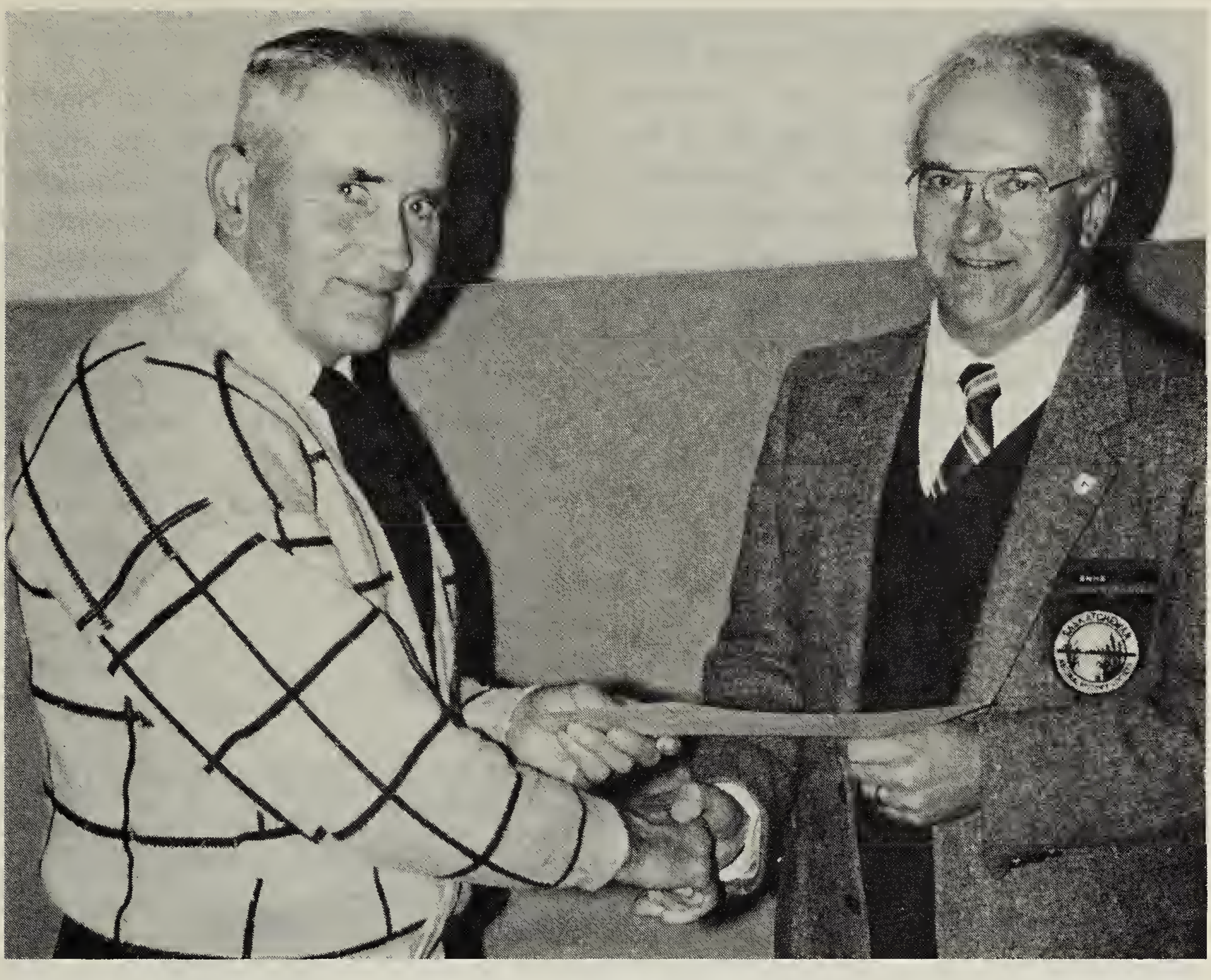
The 1991 Cliff Shaw Award for an article of special distinction in the past four issues of *Blue Jay* was awarded to Jean Bancroft of Winnipeg, Manitoba. Her article, "The range expansion of the House Finch into the Prairie Provinces," involved a tremendous amount of searching published material and obtaining unpublished records of this bird from the Pacific and Atlantic coasts and into the interior. It is an excellent example, along with her many other articles in *Blue Jay*, of what a serious amateur birder can do. Congratulations are also due to Robert Parsons, who helped Jean with the article.

1991 Larry Morgotch and Conservation Awards

Don Hooper of Somme took home two awards, the 1991 Conservation Award and the 1991 Larry Morgotch Award. Don received the Conservation Award for his initiative in the acquisition of the Rendek Elm Forest east of Hudson Bay. Don spearheaded the work in acquiring the land and played a major role in setting up trails and facilities at the forest. One of the founding members of the Hudson Bay Natural History Society and a long-time member of the provincial society, Don is an "all round conservationist."

Jean Bancroft, winner of the Cliff Shaw Award, pictured here with a 35-day-old Peregrine Falcon chick.

Robert Berger



Frank Switzer presents the Larry Morgotch Award to Don Hooper. *Curt Schroeder*

Jim Elliott presents Don Hooper with the 1991 Conservation Award. *Frank Switzer*

Don is also an avid amateur photographer. The theme of his excellent slide presentation was how the Golden-crowned Kinglet takes advantage of the work of a Yellow-bellied Saspsucker when the weather is uncooperative by feeding on sap from holes made by the sapsucker (see page 201 – Sap for Survival). The presentation won Don the 1991 Larry Morgatch Award for the best photographic story and the best photograph entered in the annual competition.

Weyburn Birdathon

On behalf of the Saskatoon Natural History Society, President Pat Adams accepted the award for the most birds (277 species) on a list for a club or society in the Weyburn Natural History Society's Provincial Summer Count 1991. Burke Korol of Saskatoon won the award for the most species identified by an individual. Burke counted 247 different species.

Pat Adams accepts the award for Most Birds on a Club List for Saskatoon N.H.S., from Dick Gutfriend of the Weyburn N.H.S. Stan Shadick accepted the award for Most Birds on an Individual's List in the Weyburn Birdathon. Stan accepted on behalf of Burke Korol.

Frank Switzer

SASKATCHEWAN NATURAL HISTORY SOCIETY STATEMENT OF FINANCIAL ACTIVITIES AND FUND BALANCE FOR THE YEAR ENDED 31 AUGUST 1991*

	1991	1990
REVENUE		
Grants - Sask Trust for Sport, Culture and Recreation: Annual Global Funding	$100,000	$100,000
Grants - Specified Programs	151,440	27,175
Grants - Other	——	2,550
Specified Programs	5,364	15,000
Bequest Trust	2,000	——
Self Generated		
Advertising	450	580
Conservation Sales	1,498	1,073
Donations	3,696	3,636
Interest	10,765	12,938
Memberships	18,197	19,334
Special Publications	774	1,038
Spring Meet	1,584	——
Tour Income	5,056	6,801
Recovery - Loggerhead Shrike	1,140	——
	301,964	190,125
EXPENSES		
Administrative Salaries and Benefits	43,154	41,033
Office - Schedule 2	28,553	27,874
Membership Communications and Publications		
Blue Jay Journal	18,223	19,049
Blue Jay News	5,955	7,189
Travel and Meetings		
Staff and Volunteer Travel	2,044	5,761
Annual & Summer Meetings	1,613	421
Board & Executive	1,595	648
Programs - Schedule 3	199,478	87,898
	300,615	189,873
INCREASE IN FUND BALANCE	1,349	252
INCOME - BOOKSHOP	533	1,153
FUND BALANCE, BEGINNING OF YEAR	44,441	43,036
FUND BALANCE, END OF YEAR	$46,323	$44,441

* Detailed financial statements are available from the SNHS office in Regina.

SASKATCHEWAN NATURAL HISTORY SOCIETY BALANCE SHEET
AS AT 31 AUGUST 1991

	1991	1990
ASSETS		
CURRENT ASSETS		
Cash	$ 81,934	$ 46,056
Cash - Bookshop	1,411	3,703
Accounts Receivable	29,157	23,013
Accounts Receivable - Bookshop	408	1,926
Investments	83,016	83,016
Inventory - Bookshop	11,213	9,600
	207,139	167,314
TRUST ACCOUNT INVESTMENTS (Note 2)	253,393	219,102
FIXED ASSETS	22,874	19,995
	$483,406	$406,411
LIABILITIES AND MEMBERS EQUITY		
CURRENT LIABILITIES		
Accounts Payable	$ 16,218	$ 19,192
Accounts Payable - Bookshop	786	1,517
Deferred Income (Note 4)	40,215	22,065
	57,219	42,774
LONG-TERM LIABILITIES		
Specified Programs (Schedule 1)	103,597	80,099
Trust Accounts (Note 2)	253,393	219,102
	356,990	299,201
MEMBERS EQUITY		
Fund Balance	46,323	44,441
Equity in Fixed Assets	22,874	19,995
	69,197	64,436
	$483,406	$406,411

A
Ablabesmyia illinoense 180
Ablabesmyia monilis 180
Ablabesmyia pulchripennis 180
Achillea megacephala - Large-headed Wooly Yarrow 163
Acopa perpallida - Sharp-toothed Groundling 122
Acricotopus senex 181
Acronicta americana - American Dagger-Moth 63
Acronicta dactylina - Fingered Dagger-Moth 63
Acronicta distans - Distans Dagger-Moth 64
Acronicta fragilis - Chain-dotted Dagger-Moth 63
Acronicta funeralis - Funerary Dagger-Moth 64
Acronicta furcifera - Forked Dagger-Moth 63
Acronicta grisea - Gray Dagger-Moth 63
Acronicta haesitata 63
Acronicta hesperida - Large Gray Dagger-Moth 63
Acronicta impleta - Powdered Dagger-Moth 63
Acronicta impressa - Impressa Dagger-Moth 64
Acronicta inclara - Unclear Dagger-Moth 63
Acronicta innotata - Unmarked Dagger-Moth 63
Acronicta interrupta - Interrupted Dagger-Moth 63
Acronicta lanceolaria - Pointed Dagger-Moth 64
Acronicta lepusculina - Cottonwood Dagger-Moth 63
Acronicta lobeliae - Lobelia Dagger-Moth 63
Acronicta longa - Long-winged Dagger-Moth 64
Acronicta mansueta - Gentle Dagger-Moth 63
Acronicta morula - Ochre Dagger-Moth 63
Acronicta noctivaga - Night-wandering Dagger-Moth 64
Acronicta oblinita - Smeared Dagger-Moth 64
Acronicta quadrata - Quadrate Dagger-Moth 63
Acronicta radcliffei - Radcliffe's Dagger-Moth 63
Acronicta sperata speratina - Sperata Dagger-Moth 64
Acronicta spinigera - Nondescript Dagger-Moth 63
Acronicta vulpina - Vulpina Dagger-Moth 63
Adam, Chris
    Snow Geese over Buck Lake, photo 144
    Waskesiu River, photo 114
Afotella cylindrica - Cylindrical Groundling 122
Agriopodes geminata - Gem Marvel 64
Agriopodes teratophora - Gray Marvel 64
Agroperina dubitans - Ruby Quaker 119
Agroperina helva - Yellow Three-spot 119
Agroperina inficita - Inficita Quaker 119
Agroperina lateritia - Red-winged Quaker 119
Agroperina lutosa - Muddy Quaker 119
Agroperina popofensis indela - Lined Quaker 119
Alberta, birds 93, lepidoptera, 183
    Airdrie, birds 36
    Beaverhill Lake, birds 79
    Bertha Lake, lepidoptera 185
    Big Lake (near St. Albert), birds 36
    Bow River, birds 70
    Bragg Creek, lepidoptera 186
    Buck Mountain, lepidoptera 186
    Busby, birds 129
    Calgary, birds 71, 78, 129, lepidoptera 188
    Canmore, birds 129
    Claresholm, birds 129
    Cooking Lake, birds 79
    Cowley, birds 36
    Del Bonita, lepidoptera 185
    Dorothy, birds 93
    Drumheller, lepidoptera 186
    Edmonton, birds 129, lepidoptera 67
    Elk Island National Park, birds 73
    Fairview, birds 33
    Goat Lake, lepidoptera 185
    Grand Prairie, birds 73
    Hanna, birds 93
    Lamont, lepidoptera 122
    Lethbridge, lepidoptera 122, 190
    Manning, birds 73
    Manyberries, lepidoptera 122
    Medicine Hat, lepidoptera 122
    Milk River, lepidoptera 185
    Namaka Lake, birds 79
    Peace River, lepidoptera 188
    Red Deer, lepidoptera 188

  - Richdale, birds 93
  - Seebe, Kananaskis, birds 129
  - Sundre, birds 122
  - Sunnynook, birds 93
  - Topaz Lake, birds 129
  - Turner Valley, birds 70
  - Vermilion Lakes, birds 129
  - Waterton Lakes National Park, birds 129 , lepidoptera 185
  - Writing-on-Stone Park, lepidoptera 122
- Albinism, birds 31, 32, 139, 141
- *Alypia langtoni* - Langton's Forester 65
- *Alypia octomaculata* - Eight-spotted Forester 65
- *Amphipoea americana* - American Ear Moth 121
- *Amphipoea interoceanica* - Interoceanic Ear Moth 121
- *Amphipyra glabella* - Gray Amphipyra 121
- *Amphipyra pyramidoides* - Copper Underwing 121
- *Androloma maccullochii* - Northern Forester 65
- *Andropolia contacta* - Canadian Giant 121
- *Angelica arguta* - Lyall's Angelica 188
- *Angelica dawsoni* - Mountain Parsnip 188
- *Angelica genuflexa* - Kneeling Angelica 188
- *Apamea alia* - Dewy Quaker 119
- *Apamea amputatrix* - Northern Quaker 119
- *Apamea apamiformis* - Wild Rice Quaker 122
- *Apamea auranticolor* - Brown-banded Quaker 118
- *Apamea cinefacta* - Gray Quaker 119
- *Apamea finitima* - Pale-banded Quaker 119
- *Apamea impulsa* - Southern Quaker 119
- *Apamea indocilis* - Broken-banded Quaker 119
- *Apamea indocilis runata* - Broken-banded Quaker 119
- *Apamea inordinata* - Montana Quaker 119
- *Apamea lignicolora* - Wood-coloured Quaker 118
- *Apamea occidens* - Western Quaker 122
- *Apamea parcata* - Parcata Quaker 119
- *Apamea plutonia* - Dusky Quaker 119
- *Apamea spadlingi* - Spalding's Quaker 119
- *Apamea verbascoides* - Mullein Quaker 118
- *Apamea vultuosa* - Airy Quaker 118
- *Apium graveolens* - Garden Celery 188
- *Archanara oblonga* - Oblong Sedge Borer Moth 120
- *Archanara subflava* - Suflava Sedge Borer 120
- *Armeria maritima* ssp. *interior* - Inland Sea Thrift 163
- *Artemisia dracunculus* - Linear Leaved Wormwood 187
- Asai, J.
  - Monarchs, photo 149
- *Aseptis charata* - Charata Quaker 121
- Ash, Mountain 158
- Atkinson, Edgar A., bird bander 59
- Award, Cliff Shaw 224
- Award, Conservation 224
  - 1991 presentation, photo 225
- Award, Larry Morgotch 224
  - 1991 presentation, photo 225

B

- Badger 44
- *Balsa labecula* - White-blotched Balsa 121
- Bancroft, Jean
  - 1991 Cliff Shaw Award 224
  - Observations of albinism in birds. 139
- Bancroft, Jean and Robert Parsons
  - Range expansion of the House Finch into the Prairie Provinces. 128
- Barton, Myron
  - Saskatchewan's North. 112
- Bat 105
- Bat, Big Brown 43
- Bat, Little Brown 43
- Baynton, Edgar, bird bander 59
- Beaver 44
- Belcher, Margaret
  - Elizabeth Roley Cruickshank 1895-1989 55
- *Bellura gortynoides* - Brown-tailed Diver 121
- *Bellura obliqua* - Pale-shouldered Brindle 121
- Berger, Robert
  - Jean Bancroft, photo 225
- Bird banding 3, 59
- Bird count
  - Christmas, 49th Annual 7
  - Christmas update 100
- Bittern, American 60
- Bjorkland, Carol
  - Black Rosy Finch on Big Muddy CBC. 137
- Blackbird, Brewer's 25, 60
- Blackbird, Red-winged 25, 81
- Blackbird, Rusty 25, 201, 214
- Blackbird, Yellow-headed 139
- Bluebird 158
- *Blue Jay* 99
- Bobcat 43
- Book review
  - A prairie coulee. WILLOCK 108
  - Bird flight. BURTON 156
  - Birder's guide to southwestern Manitoba. CUTHBERT 217
  - Butterfly gardening - creating summer magic in your garden. XERCES SOCIETY/

SMITHSONIAN INST. 109
  Extinct animals of the world. ROOTS 107
  Field checklist of Saskatchewan birds (7th edition). KREBA 111
  From the land of shadows - the making of Gray Owl. SMITH 152
  Grasslands: the private hearings. POIRIER 53
  Hawks, eagles and falcons of North America. JOHNSGARD 154
  The great butterfly hunt - the mystery of the migrating monarchs. HERBERMAN 149
  The nature fakers: wildlife, science and sentiment. LUTTS 150
  Solitudes episode three: seasons in beaver country. (video) GIBSON 154
  Vanishing animals of the world. ROOTS 107
  Venomous animals of the world. ROOTS 107
  Where the birds are. JONES 51
  With ptarmigan and Tundra Wolves. HAMPSON 218
Braddell, David L
  White-tail tail-wagging. 104
Brazier, Frank H., photo 41
  Black-tailed Godwit sighted near Regina - first for interior North America. 90
  Rosy Finch in Regina - Marjie's last bird. 40
  Mountain Plover sighting near Regina. 88
Brazier, Marjie, photo 41
  memorial 40
Brindle, Pale-shouldered, photo 119
British Columbia, birds 87, 128, 131, lepidoptera 64, 189
  Penticton, birds 128
  Revelstoke, lepidoptera 67
  Toobally Lakes, birds 73
  Vancouver Island, mammals 215
Bryophaenocladius furcatus 174
Bufflehead 25
Bunting, Snow 16, 60, 100
Buzzard, Honey 211
Byersbergen, G.W.
  Ring-billed Gulls, photo 85
C
Cardinal, Northern 133
Carlson, Muriel
  Notes on Raccoons from Edam, Saskatchewan. 101
Cat, Feral 43
Catbird, Gray 38
Catocala aholibah - Western Underwing 66
Chase, Grant, photo 194
Chat, Yellow-breasted 38
Chernovkskiia amphitrite 180
Chickadee, Black-capped 17
Chickadee, Boreal 16, 69
Chironomus anthracinus 180
Chironomus atrella 180
Chironomus atroviridis 180
Chironomus decorus 180
Chironomus plumosus 174
Chironomus riparius 180
Chironomus staegeri 180
Chironomus tentans 180
Chytonix palliatricula - Cloaked Marvel 121
Cirsium arvense - Canada Thistle 71
Cladina mitis - Reindeer Lichen, photo cover No. 4
Cladonia coccifera - Red Apothelia, photo cover No. 4
Cladopelma viridulus 180
Cliff Shaw Award
  Bancroft, Jean - 1991. 224

Collister, Douglas
  Northern Mockingbird in Calgary, photo 71
Conchapelopia telema 180
Conservation, 220
Coot, American 60
Cormorant, Double-crested 27, 81
Cornus stolonifera - Red-osier Dogwood 71
Corynoneura celeripes 181
Corynoneura sp. nr. *taris* 181
Cosmia calami - American Dun-bar 122
Cottontail, Eastern 44
Cottontail, Nuttall's 44
Coutu, Ken, photo 163
  Lake Huron Tansy, photo 169
  Mushrooms, photo 169
Coyote 44
Crambodes talidiformis - Verbena Moth 122
Crane, Sandhill 66, 81, 139
Crane, Whooping 66, 72
Crawford, Michael
  Trumpeter Swan at Mystrey Lake, south of Greenwater Lake Provincial Park, photo cover No. 2
Creeper, Brown 16
Cricotopus bicintus 181
Cricotopus curtuss 181
Cricotopus intersectus 181
Cricotopus ornatus 174
Cricotopus politus 181
Cricotopus slossonae 181
Cricotopus sylvestris 181
Cricotopus sp. nr. *tremulus* 181
Cricotopus triannulatus 181
Cricotopus trifascia 181

Crocodile, fossil 171
Crossbill, Red 25
Crossbill, White-winged 16
Crow, Amercian 5, 25, 60, 81, 123, photo 124
Cruickshank, Elizabeth Roley, photo 56
    Elizabeth Roley Cruickshank 1895-1989. 55
    Memorial 55
Crymodes burgessi - Burgess's Quaker 122
Crymodes devastator - Destructive Quaker 119
Crymodes longula - Mountain Quaker 119
Cryptochironomus conus 180
Cryptochironomus curryi 180
Cryptochironomus digitatus 180
Cryptochironomus eminentia 180
Cryptochironomus fulvus 180
Cryptochironomus ramus 180
Cryptochironomus scimitarus 180
Cryptochironomus stylifera 180
Cryptotendipes casuaris 180
Cryptotendipes darbyi 180
Cyphomella gibbera 180
D
Dagger-Moth, American, photo 62
Dagger-Moth, Ochre, photo 64
Dagger-Moth, Unmarked, photo 63
Dale, Bill
    Blue Jays and window kills, letter 158
Deer, Mule 44
Deer, White-tailed 44, 104, 146, photo 145
Derotanypus alaskensis 180
Deschampsia mackenzieana - Mackenzie Hair-grass 163
Diamesa cineralla 180
Dickson, Ross D.
    Northern Mockingbird and Swamp Swallow overwinter in Calgary. 70
Dicrotendipes nervosus 180
Diptera
    An amateur naturalist's guide to non-biting midges in Saskatchewan. 174
    Chironomidae - non-biting midges 174
Dodge, Carman
    Birds out my window. 81
Dove, Rock 16, 81, 100
Duck, American Black 25
Duck, Harlequin 25
Dutch Elm Disease, plants 117
Dypterygia rozmani - American Bird's-wing Moth 122
E
Eagle, Bald 16, 81, 100
Eagle, Golden 16, 81, 100
Egret, Cattle 36
Egret, Great 36
Egret, Snowy 37
Eichhorst, Bruce
    Close-up of intermediate male, photo 198
    Female Clark's Grebe mated with intermediate male, photo 198
Eichhorst, Bruce A. and Barry D. Parkin
    Clark's Grebes and suspected Western x Clark's Grebe hybrids in Manitoba. 196
Eider, Common 34
Eider, King 34
Einfeldia pagana 180
Elaphria festivoides - Festive Midget 121
Elk, American 215
Elk 44, photo 216
Elm 117, photo 117
    Worker finishes taking down an elm tree infected with Dutch Elm Disease, photo 117
Enargia decolor - Angle-striped Sallow 121
Enargia infumata - Lesser Angle-striped Sallow 121
Enargia mephisto - Mephisto Angle-striped Sallow 121
Endochironomus nigricans 180
Eremobina claudens - Alberta Quaker 120
Eremobina jocasta - Jocasta Quaker 122
Ermine 43
Escaria homogena - Homogena Groundling 122
Eudocimus albus - White Ibis 142
Eudryas unio - Pearly Wood Nymph 65
Euplexia benesimilis - American Small Angle Shades 121
Everitt, Roy
    Kestrel chicks, photo 75
    Male Kestrel (female), photo 75
    Male Kestrel shares incubating duties. 75
F
Falcon, Peregrine 25, 126
Falcon, Prairie 16
Felt, Harry L., bird bander 3
Financial statement
    31 August 1991 228
Finch, Black Rosy 25, 137
Finch, Brown-capped Rosy 40
Finch, Gray-crowned Rosy 25
Finch, House 128
Finch, Purple 25
Finch, Rosy 25, 40, 137
Findlay, C. Cliff
    White Ibis sighting at Shoal Lake, Manitoba. 142
Fisher 44
Flicker, Common, 139
Flicker, Northern 16
Flycatcher, Acadian 206

Flycatcher, Crested 61
Forester, Langton's, photo 65
Four Winds
    White-tailed Deer near Chelan, Sask., photo 145
Fox, Red 44
Friesen, Victor
    Crows and their (c)awing. 123
Frog, Northern Leopard, photo cover No. 3
G
Gadwall 4
Gannet, Northern 203
Gehlert, R. E.
    It's coming..., photo 159
Glypotendipes barbipes 180
Glypotendipes lobiferus 180
Glypotendipes paripes 180
Gnatcatcher, Blue-grey 202
Godwit, Bar-tailed 91
Godwit, Black-tailed 90
Godwit, Hudsonian 91
Godwit, Marbled 59, 87
Gold, John A., bird bander 59
Goldeneye, Common 16, 81
Gollop, Bernie
    Snow curves, photo 54
Goose, Barnacle 127
Goose, Brent 127
Goose, Canada 16, photo 157
Goose, Egyptian 206
Goose, Greylag 127
Goose, Snow 81, 126, 204, photo 144
Goose, Swan 206
Goose, White-fronted 81
Gopher, Northern Pocket 44
Goshawk, Northern 16, 100, 209
Grackle, Common 25, 98
Grebe, Clark's 196, 202, photos 198
Grebe, Eared 60
Grebe, Horned 4
Grebe, Red-necked 34
Grebe, Western 25, 202
Grebe, Western x Clark's 196
Grosbeak, Evening 16, 81, 100
Grosbeak, Pine 16, 70, 214
Grouse, Ruffed 16, 30
Grouse, Sage 25
Grouse, Sharp-tailed 5, 16, 100
Grouse, Spruce 25
Guillemot, Black 33
Guillemot, Pigeon 33
Gull, Black-backed 127
Gull, Black-tailed 203
Gull, Bonaparte's 76, 214
Gull, Franklin's 78, 81, 205
Gull, Glaucous 25, 205
Gull, Herring 81
Gull, Little 76, sketch 77
Gull, Ring-billed 81, 85, photo 85
Gull, Sabine 76
Gyrfalcon 25
H
Hare, Snowshoe 43
Harnischia curtilamellata 181
Harris, Wayne C.
    Bohemian Waxwings, photo 26
    Field checklist of Saskatchewan birds. 111
Harris, Wayne C., compiler
    49th annual Christmas bird count: 1990. 7
    Saskatchewan Christmas Mammal count: 1990. 43
    Christmas bird count update - Val Marie. 100
Harrisimemna trisignata - Harris' Three-spot 64
Hawk, Cooper's 25
Hawk, Ferruginous 5, 59, photo 155
Hawk, Red-tailed 5, 25
Hawk, Rough-legged 25, 100
Hawk, Sharp-shinned 5
Hawk, Sparrow 211
Hawk, Swainson's 4, 96
Hayesomyia senata 180
Helotropha reniformis - Kidney-spotted Rustic 120
Heracleum lanatum - Cow Parsnip 188, photo 186
Heron, Great Blue 81
Hicke, John
    Grayson annual report. 158
Hjertaas, Dale
    Unusual Barn Swallow nest site. 193
Holland, George.
    Second albino Great Gray Owl sighted in Manitoba. 32
Hooper, Donald F.
    Barn Swallow nest on tractor cab, photo 195
    Conservation Award, photo 225
    First documented nesting for the Nashville Warbler in Saskatchewan. 68
    Grant Chase puzzled by his haying companions, photo 194
    Larry Morgotch Award, photo 225
    Nesting swallows on the go. 194
    Sap for survival. 201
    Trumpeter Swans at Greenwater Lake, photo 73
    Trumpeter Swans in eastern Saskatchewan. 72
    Yellow-rumped Warbler feeding on sap,

photo 201
Hooper, Ronald R.
American Dagger-Moth, photo 62
Check-list of the moths of Saskatchewan part 8. 62
Check-list of Saskatchewan moths part 9. 118
European Skipper (Saskatchewan and New Jersey). photo 67
European Skipper in Saskatchewan. 67
Langton's Forester, photo 65
New Underwing Moth for the Prairie Provinces. 66
Ochre Dagger-Moth, photo 64
Unmarked Dagger-Moth, photo 63
Houston, C. Stuart.
Saskatchewan bird banders: Harry L. Felt of Findlater, bander 007. 3
Saskatchewan bird banders: Baynton, Atkinson and Gold. 59
Hydraecia pallescens - Pallid Rustic 121
Hydraecia perobliqua - Oblique Rustic 121
Hypocoena basistriga - Base-streaked Wainscot 120
Hypocoena defecta - Narrow-winged Borer 120
Hypocoena inquinata - Sordid Wainscot 120
Hypocoena rufostrigata - Brown-streaked Rustic 120
Hyppa - Hyppa 121
I
Ibis, Glossy 202
Ibis, White 142
Ibis, White-faced 202
Ipimorpha pleonectusa - Even-lined Sallow 121
Ipimorpha subvexa - Subvexa Sallow 122
J
Jackrabbit, Black-tailed 96
Jackrabbit, White-tailed 44
Jay, Blue 16, 98, 158
Jay, Gray 16
Jay, Scrub 204
Jensen, Olaf Christian
Northern Leopard Frog, photo cover No. 3
Junco, Dark-eyed 16
James, Paul C.
A comment on incubating male falcons. 143
James, Paul C. and Keith Roney
New Double-Crested Cormorant colonies in Saskatchewan. 27
James, Paul C. and Bob Kreba
Commentary: bird records in Saskatchewan and the *Blue Jay*. 99
Jonker, Peter
On site education: a first step to improved protection of endangered spaces. 220
Professor Stan Rowe explains landscape ecology of the S. Saskatchewan River Valley near Saskatoon, photo 221
Professor Stan Rowe on wind-exposed root of white spruce near William River, photo 223
K
Kestrel, American. 25, 30, 75, 139, 143, photo 75
Killdeer, 25, 60, 88
Kingbird, Eastern 4, 83
Kingbird, Western 61
Kinglet, Golden-crowned 25, 69
Kittiwake, Black-legged 202
Koes, Rudolph F.
Additions to the Manitoba Bird List (1985-1990). 202
Krivda, Walter
Mummified bats at The Pas. 105.
L
Lahrman, Fred W.
Canada Geese, photo 157
Crow, photo 124
Lamont, Sheila
Tribute 58
Landry, A.
Kettle Lake, Prince Albert National Park, photo 145
Lang, Anthony
Female Great Gray Owl on nest at Churchill, Manitoba, photo 208
Great Gray Owlets in the Churchill nest, photo 210
Habitat at the 1990 Churchill Great Gray Owl nest, photo 209
Northern Hawk Owl nest located in a broken-off spruce, photo 212
Lang, Anthony L., James R. Duncan, Scott Ramsay, and James D. Rising
Great Gray Owl and Northern Hawk Owl nests at Churchill, Manitoba. 208
Lark, Horned 16, 100
Lechea intermedia var. *depauperata* - Impoverished Pineweed - 163
Lehrman, Fred
Lesser Scaup, photo 86
Lepidoptera
Acronictinae - Dagger-Moths 62
Agaristinae - Foresters 62
Alberta swallowtails and parnassians: natural history, keys and distribution. 183
Amphipyrinae - Quakers and Borers 118
Check-list of the moths of Saskatchewan part 8. 62

    Check-list of Saskatchewan moths part 9. 118
    European Skipper in Saskatchewan. 67
    New Underwing Moth for the Prairie Provinces. 66
Lomatium dissectum - Mountain Wild Parsnip 188
Lomatium triternatum - Western Wild Parsnip 188
Longspur, Lapland 8
Loon, Common 81
Loon, Yellow-bellied 202
Luperina passer - Dock Rustic 119
Luperina stipata - Stipata Rustic 119
Lynch, Wayne
    Deer Mouse, photo 144
    Elk, photo 216
    Ferruginous Hawk, photo 155
    Northern Hawk Owl, photo 15
    Untitled, photo 113
    Winter scene, photo 138

M

Magpie, Black-billed 5, 16, 100, photo 162
Maine, birds 128
Mallard 4, 16, 60, 81
Mammal count
    Saskatchewan Christmas 1990. 43
Manitoba, birds 76, 196, 202, lepidoptera 64
    Altona, birds 130
    Aweme, lepidoptera 122
    Birtle, mammals 146
    Blackfox Lake, birds 197
    Carberry, birds 130
    Cartwright, lepidoptera 122
    Churchill, birds 78, 202, 208, photos 208-210
    Dauphin, birds 38
    Delta, birds 139, 202
    Delta Research Station, birds 73, 196
    East Delta Marsh, birds 196
    Grand Rapids, birds 78
    Hudson Bay, birds 203
    Lac du Bonnet, birds 29
    Lake Dauphin, birds 78
    Lake of the Woods, birds 79, 205
    Lake Winnipegosis, birds 204
    Leaf Rapids, birds 73
    Lynn Lake, birds 73
    Marshy Point, birds 199
    Natalie Lake, birds 202
    Norway House, birds 31, 72, photos 31
    Oak Hammock Marsh WMA, birds 203
    Oakbank, birds 130
    Patricia Beach, birds 32, 76
    Pelican Lake, birds 196, 202
    Pinawa, birds 76
    Poplar Point, birds 204
    Riding Mountain National Park, birds 38, 202, 215
    St. Francois Xavier, birds 206
    Shoal Lake, birds 142
    Stonewall, birds 130
    The Pas, mammals 105
    Transcona, lepidoptera 65
    University of Manitoba (campus), birds 126
    Wabowden, birds 210
    White Goose Lake, birds 211
    Whitewater Lake, mammals 215
    Winnipeg, birds 32, 126, 130, 139, 204, lepidoptera 67
Map
    location of 1990 counts, CBC 13
    location of four areas on the East Delta Marsh, Manitoba, where Clark's Grebes and intermediates were observed 196
    Papilio canadensis 192
    Papilio eurymedon 192
    Papilio machaon 191
    Papilio multicaudatus 192
    Papilio zelicaon 191
    Papilio zelicaon x machaon 191
    Parnassius phoebus 191
    Reported sightings of the House Finch in the Prairie Provinces 132
Martin, Pine 43
Martin, Purple 139
Mason, P.G., P.W. Parker and P. Morrill
    An amateur naturalist's guide to non-biting midges in Saskatchewan. 174
McCormick, Kevin J. and Jacques Sirois
    Female scaup incubates Ring-billed Gull eggs. 85
Melit, Lawrence
    Western Underwing, photo 66
Melit, Lorie
    Copper Underwing, photo 120
    Destructive Quaker, photo 118
    Pale-shouldered Brindle, photo 119
Memorial
    Elizabeth Roley Cruickshank 1895-1989. 55
    Rosy Finch in Regina - Marjie's last bird. 40
Merganser, Common 25, 81
Merganser, Red-breasted 25
Merlin 16, 81
Merolonche lupini - Lupine Dagger-Moth 64
Messer, Deni-Vermai
    A Crude Sound. 106
    Massacre. 106
    Mother Earth. 148
    The Price of Progress. 106
Micropsectra dives 181

Micropsectra nigripila 181
Micropsectra polits 181
Microtendipes caducus 181
Microtendipes pedellus 181
Mink 44
Mockingbird, Northern 38, 70, photo 71
Monarchs, photo 149
Moose 44
Moth, Leaf Roller 82
Mouse, Deer 44, photo 144
Mouse, House 44
Muskrat 44

N

Nanocladius anderseni 182
Nanocladius crassocornis 182
Nanocladius spiniplenus 182
Nelson, John F.
  Spotted Redshank sighted near Regina. 87
Nero, Robert W.
  Blue Jay scavenging window-kills. 98
  Focal concentration: a possible cause of mortality in the Great Gray Owl. 28
  Oak Leaf Haven. 147
  Peregrine Falcon attacks Snow Goose. 126
  White Great Gray Owl. 31
New Brunswick, birds 134, lepidoptera 67
Newfoundland, birds 87, lepidoptera 67
Nighthawk, Common 81
Nilothauma babiyi 181
Northwest Territories, birds 33, 36
  Baker Lake, birds 33
  Cameron River, birds 33
  Fort Good Hope, birds 33
  Fort Simpson, birds 37
  Fort Smith, birds 36
  Great Slave Lake, birds 33, 36, 85
  Hardisty Island, birds 34
  Hay River, birds 36
  Nahanni, birds 73
  Yellowknife, birds 33
Nuthatch, Red-breasted 16
Nuthatch, White-breasted 16

O

Odocoileus virginianus - White-tailed Deer 146
Oligia bridghami - Bringham's Brocade 120
Oligia egens - Neumogen's Quaker 120
Oligia fractilinea - Lined Stalk-borer 120
Oligia illocata - Wandering Quaker 120
Oligia mactata - Prairie Quaker 120
Oligia modica - Black-banded Brocade 120
Oligia obtusa - Obtuse Quaker 120
Oligia tonsa - Short-cloaked Quaker 120
Ontario, birds 87
  Guelph, birds 133
  Hudson Bay, birds 78
  James Bay, birds 78, 203
  London, lepidoptera 67
  Moosonee, birds 203, 211
  Niagara-on-the-Lake, birds 130
Oriole, Northern 82
Orthocladius carlatus 182
Orthocladius mallochi 182
Orthocladius nigritus 182
Orthocladius obrumbatus 182
Orthocladius rivicola 182
Orthocladius robacki 182
Osprey 81
Otter, River 43
Owl, Barred 25, 28
Owl, Burrowing 93
Owl, Great Horned 5, 16, 30, 69, 100
Owl, Great Gray 25, 28, 31, 32, 139, 208, photos cover No. 1, 31, 208-210
Owl, Northern-Hawk 25, 29, 208, photo 15, (nest) 212
Owl, Northern Saw-whet 25
Owl, Short-eared 16, 100, 211
Owl, Snowy 16, 127
Owl, Ural 211

P

Palaentology 171
Papaipema aweme - Aweme Borer Moth 122
Papaipema cataphracta - Burdock Borer Moth 121
Papaipema circumlucens - Hops Borer Moth 121
Papaipema furcata - Ash Tip Borer Moth 122
Papaipema harrisii - Cow Parsnip Borer Moth 121
Papaipema leucostigma - Columbine Borer 121
Papaipema marginidens - Water Hemlock Borer Moth 121
Papaipema nelita - Nelita Borer Moth 122
Papaipema rigida - Rigid Sunflower Borer Moth 122
Papaipema unimoda - Meadow Rue Borer Moth 121
Papaipema verona - Verona Borer Moth 122
Papilio bairdii brucei 187
Papilio canadensis 183
Papilio eurymedon 183
Papilio machaon 183
Papilio machaon dodi, photo 186
Papilio multicaudatus - Two-tailed Swallowtail 190
Papilio rutulus - Western Tiger Swallowtail 189
Papilio zelicaon 183, photos 186

Parachironomus abortivus 181
Parachironomus frequens 181
Parachironomus tenuicaudatus 181
Paracladopemla nereis 181
Paracladopemla winnelli 181
Parakiefferiella tortulata 182
Paralauterborniella nigrohalterale 181
Parastichtis discivaria - Mottled Quaker 120
Paratanytarsus confusus 181
Paratanytarsus laccophilus 181
Paratendipes albimanus 181
Parnassian 183
Parnassius clodius 184
Parnassius phoebus 183
Parnassius phoebus smintheus 183
Partridge, Gray 6, 16, 100, photo 11
Partridge, Hungarian 6
Pastinaca sativa - Garden Parsnip 188
Pelican, White 81, photos 42, 156
Peronne, Marie
  Black Swallowtail, letter 192
Petasites palmatus - Palmate-leaved Coltsfoot 187
Phaenopsectra obediens 181
Pheasant, Ring-necked 16, 100
Phlogophora iris - Olive Angle Shades 121
Phlogophora periculosa - Great Angle Shades 121
Phosphila miselioides - Spotted Phosphila 121
Photo
  Members of group guided through the Athabasca Sand Dunes, 1991, 222
Picea pugens - Colorado Spruce 133
Pintail 4
Pintail, Northern 59
Pipit, Sprague's 59
Plagimimcus expallidus - Expallidus Brown 122
Platyperigia extima - Civil Rustic 121
Platyperigia meralis - Mooned Rustic 121
Platysenta discinstringa - Streaked Groundling 122
Platysenta videns - White-dotted Groundling 122
Plover, Mountain 88
Poem
  A Crude Sound 106
  Massacre 106
  Mother Earth 148
  Oak Leaf Haven 147
  The Price of Progress 106
  Saskatchewan's North 112
Polypedilum sp. nr. *aviceps* 181
Polypedilum convictum 181
Polypedilum digitifer 181
Polypedilum fallax 181
Polypedilum illinoense 181
Polypedilum laetum 181
Polypedilum obtusum 181
Polypedilum scalaenum 181
Populus balsamifera - Balsam Poplar 71
Porcupine 44
Potthastia longimana 180
Procladius bellus 180
Procladius denticulatus 180
Procladius freemani 180
Procladius nietus 180
Pronghorn 44
Protagrotis extensa - Dark white-veined Quaker 119
Protagrotis niveivenosa - White-veined Quaker 119
Protoperigia posticata - White-winged Quaker 122
Proxenus miranda - Glistening Rustic 121
Psectrocladius flavus 182
Psectrocladius simulans 182
Psectrotanypus alaskensis 180
Psectrotanypus dyari 180
Pseudanarta crocea - Yellow Orange-wing 121
Pulson, J.
  White Pelicans, photo 156

Q

Quaker, Destructive, photo 118
Quebec, birds 134, lepidoptera 67

R

Rabbit, Black-tailed Jack 96
Raccoon 44, 101, photo 102
Radwanski, Elaine
  White-headed Redpoll. 141
  Redpoll with hood, photo 141
Rail, Black 203
Raven, Common 16, 124, 209
Raven, Northern 81
Redhead 4
Redpoll, Common 16, 70, 141, photo 141
Redpoll, Hoary 16, 141
Redshank, Spotted 87
Redstart 68
Rheotanytarsus exiguus 181
Rhizagrotis albalis actona - Actona Sallow 122
Roadrunner, Greater 204
Robackia claviger 181
Robackia demeijerei 181
Robin, American 16, 60, 81, 98
Ross, S.
  Fiery sunrise, Prince Albert National Park,

  photo 112
Rowe, Professor Stan, photos 221, 223
Roy, Frank, photo 163
  Abundance of cones on a black spruce, photo 166
  Aerial view of dunes east of the William River, photo 164
  Dennis Tyson and George Tosh look to the William River Dunes, south shore Lake Athabasca, photo 166
  Desert sands and water, photo 165
  Dunes rise above the William River, photo 167
  Felt-leaved Willow, photo 169
  "Gobi" desert pavement, photos 168
  Horsehead landmark, Little Gull Lake, photo 170
  Pine clings to life above the William River, photo 165
  Sands move on, photo 166
  Slow-moving sand overtakes muskeg and forest, Little Gull Lake, photo 164
S
Saetheria tylus 181
Salamander, Tiger 94
Salix brachycarpa var *psammophila* - Short-fruited Sand Willow 163
Salix silicicola - Felt-leaved Willow 163
Salix turnorii - Turnor's Willow 163
Salix tyrrelli - Tyrrell's Willow 163
Sandpiper, Buff-breasted 61
Sandpiper, Stilt 90
Sandpiper, Upland 59
Sapsucker, Yellow-bellied 68, 201
Saskatchewan, birds 99, diptera 174, lepidoptera 79, 118, plants 117
  Abernethy-Katepwa Lake CBC 8, CMC 44
  Anglin Lake, lepidoptera 120
  Archerwill, birds 141
  Assiniboia CBC 8, CMC 44, lepidoptera 67 mammals 103
  Athabasca Sand Dunes, 163, photos 164-170, 222
  Aylsham, lepidoptera 64, 118
  Bainbridge, lepidoptera, 121
  Bangor, CBC 8, CMC 44
  Battleford, CBC 26
  Battlefords Provincial Park, lepidoptera 63, 121
  Belbutte, birds 60
  Bertwell, lepidoptera 64
  Bethune, birds 5, CBC 8, CMC 44
  Big Beaver, birds 137
  Big Muddy Lake, birds 137, CBC 8, CMC 44, lepidoptera 63
  Big Muddy Valley, CBC 8, CMC 44
  Big Piwei Lake, birds 69
  Big River, CBC 8, CMC 44
  Biggar, CBC 8, CMC 44
  Birch Hills, CBC 8, CMC 44
  Bird bander 3, 59
  Bjork Lake, birds 73
  Bjorkdale, lepidoptera 121
  Blaine Lake, mammals 103
  Broadview, CBC 8
  Bromhead, CBC 8, CMC 44
  Buffalo Pound Lake, birds 5
  Buffalo Pound Provincial Park, lepidoptera 63, 121
  Candle Lake, CBC 8, CMC 45, mammals 103
  Carlyle, mammals 102
  Carragana, birds 69, CBC 8, CMC 45
  Carrot River, CBC 26, palaentology 171, plants 117
  Chelan, photo 145
  Christopher Lake, mammals 103
  Churchill Lake, birds 27
  Clearwater River, lepidoptera 65, 121
  Crane Lake, birds 59
  Creighton, lepidoptera 119
  Crooked Lake, CBC 8, CMC 45
  Cumberland House, lepidoptera 63, 119
  Cutknife, lepidoptera 122
  Cypress Hills, birds 73, diptera 177, lepidoptera 63, 185
  Deschambault Lake, birds 78, lepidoptera 119
  Devil's Lake, CBC 8
  Dilke, birds 6, CBC 8
  Disley, mammals 102
  Douglas Provincial Park CBC 8, CMC 45, lepidoptera 64
  Duck Mountain Provincial Park, lepidoptera 120
  Dundurn (Blackstrap Lake), birds 78
  Duval, CBC 8, 25, CMC 45
  Earl Gray, lepidoptera 63, 121
  Eastend, CBC 9, CMC 45
  Echo Lake, birds 74
  Edam, CBC 9, CMC 45, mammals 101
  Endeavour, CBC 9
  Erwood, lepidoptera 63
  Estevan, birds 193, CBC 9, CMC 45, mammals 102, plants 117
  Eston, lepidoptera 65
  Estuary, lepidoptera 121
  Fife Lake, CBC 9, CMC 45
  Findlater, birds 3
  Fond du Lac River, birds 73
  Fort Esperance, lepidoptera 121
  Fort Qu'Appelle, birds 131, CBC 9, CMC

46, lepidoptera 63, 66, 118
Fort Walsh, CBC 9, CMC 46
Foster Lake, lepidoptera 63
Frenchman River Valley, CMC 43
Gardiner Dam, CBC 9, CMC 46
Geikie River, lepidoptera 121
Glen Ewen, lepidoptera 63, 121
Good Spirit Lake, CBC 9, CMC 46
Gordon Lake, lepidoptera 121
Govenlock, CBC 9, CMC 46
Grand Centre, CMC 46
Grand Centre-Pierceland, CBC 9
Grand Coulee, plants 117
Grasslands National Park, CBC 9, CMC 46, diptera 177
Grayson, letter 158
Great Sand Hills, birds 59
Greenbush Campsite, lepidoptera 65
Greenbush River, birds 68
Greenwater Provincial Park, birds 69, 72, photo cover No. 2, 73
Halbrite, lepidoptera 118
Harlan, lepidoptera 120
Hudson Bay, birds 68, 73, CBC 9, CMC 46, lepidoptera 63, 120
Humboldt, CBC 9, CMC 46
Ile-a-la-Crosse, mammals 102
Indian Head, CBC 9, CMC 47, mammals 103
Kamsack, CBC 9, CMC 47, lepidoptera 63
Kazan Lake, birds 69
Kelvington, CBC 9
Kenaston, CBC 9, CMC 47
Kettle Lake, photo 145
Killdeer, lepidoptera 119
Kindersley, CBC 9, CMC 47
Kinistino, birds 6
Kutawagan Lake, CBC 9, CMC 47
La Loche, lepidoptera 65
La Ronge, CBC 9, CMC 47, lepidoptera 63, 119
Lac des Isles, birds 73
Lake Athabasca, birds 78, diptera 177, photo 166
Lake Diefenbaker, CBC 7
Last Mountain Lake, birds 5, 199
Last Mountain Lake WMU, CBC 9, CMC 47
Leader, CBC 9, CMC 47
Limerick, lepidoptera 121
Little Gull Lake, birds 78, photos 164, 170
Little Nut Lake, birds 131
Livelong, CBC 9
Loon Lake, lepidoptera 120
Love, lepidoptera 63, 119
Love-Torch River, CBC 9, CMC 47
Lumsden, birds 4, lepidoptera 64, 122
Luseland, CBC 9, CMC 48
Maidstone Bridge, CBC 9, CMC 48
Maple Creek, birds 59
Marean Lake, birds 72
Marsden, CBC 9, CMC 48
Maryfield, lepidoptera 63, 121
Meadow Lake, mammals 102
Meadow Lake Provincial Park, lepidoptera 63, 120
Medstead, birds 60
Melfort, lepidoptera 120
Melville, CBC 9, CMC 48
Milliken Lake, lepidoptera 65
Mirond Lake, birds 73
Missinipe, CBC 9
Montreal Lake, birds 73
Montreal River, birds 69
Moose Jaw, CBC 9, CMC 48, lepidoptera 63
Moose Mountain, lepidoptera 63, mammals 102
Moose Mountain Provincial Park, lepidoptera 63
Mullinger, mammals 103
Mystrey Lake, birds 74, photo cover No. 2
Neely Lake, CBC 10
Nipawin, lepidoptera 63
Nipawin Provincial Park, lepidoptera 63, 119
Norquay, lepidoptera 120
North Battleford, birds 73, mammals 101
North Saskatchewan River, birds 81, mammals 101
Northside, mammals 103
Old Wives Lake, lepidoptera 119
Onion Lake, lepidoptera 121
Otter Rapids, lepidoptera 63
Outlook, CBC 7
Outlook Regional Park, lepidoptera 121
Oxbow, lepidoptera 121, 122
Pelican Narrows, birds 73
Peter Pond Lake, birds 27
Piapot, birds 60
Pike Lake, CBC 10, CMC 48, lepidoptera 63
Pine Island, mammals 101
Piwei River, birds 194
Porcupine Plain, birds 72, CBC 10
Porter Lake, lepidoptera 63
Prince Albert, birds 81, CBC 10, CMC 48, lepidoptera 64, 120
Prince Albert National Park, birds 69, CBC 10, CMC 48, lepidoptera 64, photos 112-114, 145
Punnichy, lepidoptera 119
Qu'Appelle Dam, CBC 10, CMC 48
Qu'Appelle Valley, birds 74, mammals 102
Rabbit Lake, birds 60

Radville, birds 60
Ravenscrag, lepidoptera 121
Raymore, CBC 10, CMC 49
Red Earth, lepidoptera 120
Regina, birds 33, 40, 78, 83, 87, 88, 90, 131, 193, CBC 10, CMC 49, lepidoptera 65, 119, mammals 102, palaeontology 172
Richardson, birds 88
Rocanville, plants 117
Roche Percee, lepidoptera 63, 119
Rosefield, lepidoptera 63, 122
Rosthern, mammals 103
Round Lake, CBC 10, CMC 49, lepidoptera 122, mammals 103
Saskatchewan Landing Provincial Park, lepidoptera 119
Saskatchewan River, diptera 174
Saskatoon, birds 95, 96, 131, CBC 10, CMC 49, diptera 177, lepidoptera 119
Scott, CBC 10, CMC 49
Shady Lake, photo 114
Shaunavon, plants 117
Shoal Lake, lepidoptera 119
Skull Creek, CBC 10, CMC 49
Snowden, CBC 10, CMC 49
Somme, birds 131, 195, 201, CBC 10, lepidoptera 64, 121
South Saskatchewan River Valley (near Saskatoon), photo 221
Spalding, CBC 11, CMC 49
Spinney Hill, CBC 11, CMC 49
Spring Valley, CBC 11, CMC 50
Squaw Rapids, birds 74, CBC 11, CMC 50, mammals 103
Stony Rapids, birds 73
Sturgeon Landing, lepidoptera 63, 121
Swift Current, CBC 11, CMC 50, lepidoptera 64, 122
Tantallon, lepidoptera 63, 118
Tisdale, CBC 11
Tobin Lake, diptera 174
Torch River, birds 73
Trossachs, lepidoptera 63
Turtle Lake, CBC 11
Turtlelake River, mammals 101
Uranium City, lepidoptera 65
Val Marie, birds 88, CBC 100, lepidoptera 121
Valeport, birds 74
Vawn, mammals 101
Veillardville, birds 73
Wadena, lepidoptera 120
Waldsea Lake, diptera 174
Wasekamio Lake, birds 27
Waskesiu River, diptera 174, photo 114
Weekes, lepidoptera 64, 121
Weyburn, birds 131, 193, CBC 11, CMC 50
White Bear, CBC 11, CMC 50
White Bear Lake, CBC 11, CMC 50
Whitebeech, CBC 11, CMC 50
Whitewood, CBC 11, CMC 50
William River, 163, photos 164, 165, 167, 168, 223
Woodlawn Regional Park, plants 117
Yorkton, CBC 11, CMC 50
Scaup, Greater 85
Scaup, Lesser 4, 25, 85, photo 86
Schmidt, A.
  Gray Partridge, photo 11
Schmutz, Josef K., Gwendolyn Wood and Daniel Wood
  Spring and summer prey of Burrowing Owl in Alberta. 93
Schroeder, Curt
  Frank Switzer presents award to Don Hooper, photo 225
Scott, Lorne
  Black-billed Magpie, photo 162
  Elizabeth Roley Cruickshank, photo 56
  Land clearing, photo 148
Seib, Gary W.
  Raccoon, photo 102
Shelduck, 127
Shoveler, Northern 4, 59
Shrew, Masked 44
Shrike, Loggerhead 60
Shrike, Northern 16, 100
Simyra henrici - Henry's Marsh Moth 64
Sirois, Jacques
  First record of the Black Guillemot near Yellowknife, Northwest Territories. 33
Sirois, Jacques, George Low, and John Turquand McCollum
  First Great Egret record in the Northwest Territories. 36
Siskin, Pine 16
Sium suave - Water Parsnip 188
Skipper, European 67
Skunk, Striped 29, 44
Solitaire, Townsend's 25
Sparrow, American Tree 16
Sparrow, Brewer's 202
Sparrow, Eurasian Tree 206
Sparrow, Fox 25, 201
Sparrow, Harris' 25
Sparrow, House 16, 30, 81, 82, 98, 100, 134, 139, 158, 206, photo 140
Sparrow, Song 25
Sparrow, Swamp 70
Sparrow, Vesper 206

Sparrow, White-throated 25, 68
Spartiniphaga includens - Silver-C Borer 120
Spartiniphaga inops - Single-spot Borer 120
Spartiniphaga panatela - Panatela Borer 120
Sperling, Felix
  3rd instar of *Papilio zelicaon* on *Heracleum lanatum*, Buck Mountain, Alberta, photo 186
  5th instar of *Papilio zelicaon* on *Angelica* leaf, photo 186
  Papilio machaon dodi, Drumheller, Alberta, photo 186
Sperling, Felix and Norbert Kondla
  Alberta swallowtails and parnassians: natural history, keys, and distribution. 183
Spodoptera frugiperda - Fall Armyworm Moth 122
SPRR
  Worker finishes taking down an elm infected with Dutch Elm Disease, photo 117
Squirrel, Fox 44
Squirrel, Grey 44
Squirrel, Ground 96
Squirrel, Northern Flying 44
Squirrel, Red 44, 103
Squirrel, Richardson's Ground 44, 93
Starling, European 16, 81
Stellaria arenicola - Sand Chickweed - 163
Stenochironomus hilarus 181
Stibadium spumosum - Frothy Moth 122
Stinson, Cst. Jim
  Great Gray Owl, near Norway House, MB, photo cover No. 1, photo 31
Stiria rugifrons - Yellow Groundling 122
Strange, K.
  Aspen stand, Prince Albert National Park, photo 113
Swallow, Barn 59, 81, 193, photo (nest) 195
Swallow, Cliff 4
Swallow, Tree 158
Swallowtail 183
Swallowtail, Black 192
Swan, Mute 203
Swan, Trumpeter 72, photo cover No. 2
Swan, Tundra 25, 72, 81, 203
Switzer, Frank
  Copy-cat feeding of House Sparrows. 82
  Jim Elliott presents Don Hooper with award, photo 225
  Long-tailed Weasel, photo 43
  Pat Adams accepts award for Most Birds on a Club List for Saskatoon NHS, from Dick Gutfriend of Weyburn NHS. Stan Shadick accepts award for Most Birds on an Individual's List on behalf of Burke Korol, photo 226
  Sand hills near Webb, photo 35
  Tribute to Sheila Lamont, 58
  White Pelican, photo 42
Synorthocladius semivirens 182
Syroteuk, Merv
  Shady Lake, Prince Albert National Park, photo 114
T
Tanacetum huronense var *floccosum* - Lake Huron Tansy - 163
Tanager, Scarlet 38
Tansy, Lake Huron, photo 169
Tanypus punctipennis 180
Tanytarsus glabrescens 181
Tanytarsus guerlus 181
Taraxacum officinanale - Dandelion 189
Taylor, Ernest
  Albino House Sparrow, photo 140
Taylor, Peter
  Little Gull in southern Manitoba and adjacent regions, with notes on juvenile plumage. 76
  Little Gull - juvenile plumage, sketch 77
Taylor, Robert R.
  Great Gray Owl, near Lac du Bonnet, MB, photo 29
Teal, Blue-winged 4
Teal, Green-winged 4, 59
Tern, Black 81
Thienemanniella cf. *xena* 182
Thrasher, Brown 38, 70
Thrush, Hermit 201
Thrush, Swainson's 98
Thrush, Varied 25, 40
Thrush, Wood 40
Thymelicus lineola - European Skipper 67
Tokaryk, Tim T.
  Cutbank of the Carrot River, photo 171
  Fossil crocodile discovered along the Carrot River. 171
  The skull, turned upside down, in the rock, photo 172
Tosh, George, photos 163, 166
  Red Apothelia, *Cladonia coccifera* (L.) Willd., nestled in Reindeer Lichen, *Cladina mitis* (Sandst.) Hustich, photo cover No. 4
  Turnor's Willow, photo 169
  William Lake, photo 168
Tosh, Margaret
  Members of party to the Athabasca Sand Dunes, photo 163
Trachea delicata - Delicate Trachea 121
Trichoplexia exornata - Northern Banded Quaker 119

Turkey, Wild 25
Tvetenia vitracies 182
Tyson, Dennis, photos 163, 166
U
Underwing, Copper, photo 120
Underwing, Western, photo 66
United States
    Alabama, birds 88
    Alaska, birds 36
    California, birds 88, 204, diptera 174
    Colorado, lepidoptera 67
    Connecticut, birds 87
    Florida, birds 89, diptera 174
    Hawaii, birds 139
    Idaho, birds 73, 88, 128, 137, 204
    Illinois, birds 128, lepidoptera 67
    Iowa, birds 126
    Kansas, birds 204
    Louisiana, birds 4
    Maine, birds 134
    Maryland, birds 128, 204
    Michigan, birds 88, lepidoptera 67
    Minnesota, birds 4, 73, 79, 129, 213, lepidoptera 67
    Mississippi, birds 88
    Montana, birds 72, 79, 88, 128, 137, lepidoptera 64, 122
    Nebraska, birds 4
    Nevada, birds 73, 87, 88, 137
    New Hampshire, birds 134
    New Jersey, birds 139, lepidoptera 67
    New York, birds 128, lepidoptera 67
    North Dakota, birds 79, 204, lepidoptera 66, 67
    Ohio, lepidoptera 67
    Oregon, birds 73, 88, 128, lepidoptera 64
    Pennsylvania, birds 87
    Rhode Island, birds 87
    South Carolina, birds 128
    South Dakota, birds 4, 73, 79, 128, lepidoptera 66
    Texas, birds 5
    Utah, birds 137, 199, lepidoptera 65
    Vermont, birds 134
    Virginia, birds 88
    Washington, birds 89, 128
    Wisconsin, birds 128, 139, lepidoptera 67
    Wyoming, birds 72, 88, 128, 204
    Vermont, birds 134
V
Vireo, Red-eyed 38, 68
Vireo, Solitary 68
Vole, Gapper's Red-backed 44, 213
Vole, Meadow 44
Vole, Northern Red-backed 213
Vulture, Turkey 25, 81, 127
W
Wagtail, Yellow 204
Walley, William J.
    Elk calf "hides" underwater. 215
    White-tailed buck attempts to mate with wounded doe. 146
    Yellow-breasted Chat near Riding Mountain National Park, Manitoba. 38
Warbler, Blackburnian 68
Warbler, Black-throated Green 68
Warbler, Blue-winged 204
Warbler, Chestnut-sided 68
Warbler, Connecticut 68
Warbler, Magnolia 69
Warbler, Mourning 68
Warbler, Nashville 68
Warbler, Prairie 205
Warbler, Prothonotary 205
Warbler, Yellow 68
Warbler, Yellow-throated 205
Warbler, Yellow-rumped 68, photo 201
Waterthrush, Northern 68
Waxwing, Bohemian 16, 70, 158, photo 26
Waxwing, Cedar 16, 81, 82
Weasel, Least 44
Weasel, Long-tailed 44, photo 43
Weyburn Birdathon Awards 226
Wheatear, Northern 202
Widgeon, American 139
Willet 87
Willow, Felt-leaved, photo 169
Willow, Turnor's, photo 169
Wolf, Timber 44, 104
Woodpecker, Black-backed 25
Woodpecker, Downy 16, 158
Woodpecker, Hairy 16, 158
Woodpecker, Pileated 16, 38
Woodpecker, Three-toed 25
Wren, House 60, 158
Wren, Winter 68
Y
Yellowlegs, Greater 87, 90
Yellowlegs, Lesser 87
Yellowthroat, Common 68
Yukon, birds 73
X
Xenochironomus scopulus 181
Xenochironomus xenolabis 181
Xylomoia chagoni - Chagnon's Quaker 120
Z
Zizia aptera - Heart-leaved Alexanders 188

MEMBERSHIP RENEWAL AND GIFT FORM

Name ....

Address ....

....

City/Town .... Prov. .... Postal Code ....

MOVING? To avoid missing any issues of the *Blue Jay*, please write your old address above, and your new address below:

Name ....

Address ....

....

City/Town .... Prov. .... Postal Code ....

Effective ....

Membership Type (Please check) (Prices listed in Canadian funds)

Regular — Canada ($15) .... [ ]
Family — Canada ($20) .... [ ]
Youth — Canada ($8) .... [ ]
Sustaining ($30) .... [ ]
Patron ($60) .... [ ]
Life ($600) .... [ ]

Regular — outside Canada ($18) .... [ ]
No. of family members .... [ ]
Senior Citizen — Canada ($13) .... [ ]
An income tax receipt for Life,
Patron, or Sustaining Membership
and Donations — check here .... [ ]

I am a new member for 199__

This is a renewal for 199__

I wish to make a donation to:

Conservation Fund $_____ .... [ ]
Heritage Marshes Fund $_____ .... [ ]
Other $_____ .... [ ]

Check above if receipt is required.

* **Life membership** is payable at one time, or over five years, or any shorter period agreed.

* Any amount over $10 in excess of the regular membership of $15 is viewed as a **donation** for income tax purposes and a receipt for the excess amount will be mailed if the appropriate box is checked above.

* **Bulk subscriptions** to schools and clubs are $15 for the first subscription and $13 for each additional subscription to the same address (minimum of five subscriptions).

Please send ***Blue Jay* Gift Subscription** to:

Name ....

Address ....

City/Town .... Prov. .... Postal Code ....

[ ] Check here if you wish us to send a card announcing the gift.

Type of membership (Please check) (Prices listed in Canadian funds)

Individual — Canada ($15) .... [ ]
Family — Canada ($20) .... [ ]
Youth — Canada ($8) .... [ ]

Individual — Outside Canada ($18) .... [ ]
No. of family members .... [ ]
Senior — Canada ($13) .... [ ]

*Send renewal form to

SNHS
Box 4348
Regina, Saskatchewan
S4P 3W6

Make cheques and money orders payable to **Saskatchewan Natural History Society**.

Your donation will be acknowledged in Blue Jay News by name only. Check here if you *do not* wish to be acknowledged. [ ]

* Do you know of any person interested in natural history and conservation who does not receive the *Blue Jay*? Please send their name and address and we will send a sample *Blue Jay* and an invitation to join our Society.

THIS ORGANIZATION RECEIVES FUNDING FROM:

Saskatchewan
LOTTERIES
LOTTERY TICKET CENTRE

SASKATCHEWAN NATURAL HISTORY SOCIETY
BOX 4348, REGINA, SASKATCHEWAN S4P 3W6
(306) 780-9273 FAX (306) 781-6021

BLUE JAY BOOKSHOP
SUB P.O. 8, 1210 7th AVENUE N.,
SASKATOON, SASKATCHEWAN S7K 2W2

BOARD OF DIRECTORS

OFFICERS

Honorary President	Frank Brazier	2657 Cameron St., Regina S4T 2W5
President	Frank Switzer	1301 Shannon Road,Regina S4S 5K9
Past President	vacant	
First Vice-President	Doug Schmeiser	College of Law, Sub. P.O. 6, U. of S., Saskatoon S7N 0W0
Second Vice-President	Paul James	2211 Cameron St. Regina S4T 3V9
Treasurer	Bob Ewart	2818 Sinton Ave., Regina S4S 1K3
Secretary	Phyliss Bordass	Box 313, Ft.Qu'Appelle S0G 1S0
EXECUTIVE DIRECTOR	Curt Schroeder	1067-3rd Ave. N.E., Moose Jaw S6H 1E8

APPOINTED DIRECTORS

Blue Jay Bookshop	Burt and Lois Gibson	Box 22270, Regina, SRS 7H4
Blue Jay Editor	J. Lynn Brown	312 McKinnon Ave. S., Saskatoon S7N 1J6
Blue Jay News Editor	John Pollock	Box 353, Whitewood S0G 5C0
CNF Representative	vacant	
Conservation	Jim Elliott	2258 Rae St., Regina S4T 2E9
Endangered Species & Spaces	Andy Didiuk	314 Egbert Ave., Saskatoon S7N 1X1
Finance Chairman	Jim Slimmon	2526 Hanover Ave., Saskatoon S7J 1G1
Special Publications	Mary Gilliland	902 University Dr., Saskatoon S7N 0K1
Membership	Del Cairns	2356 Montague St., Regina S4T 3K4
Member Initiatives	Merv Hey	104 Dunlop St., Saskatoon S7N 2B5
Tour Director	Stanley Shadick	304-1008 Temperance St., Saskatoon S7N 0N6

REPRESENTATIVES AT LARGE

Ray Belanger	412 McGillvary Dr., Weyburn S4H 1M1
Kim Finley	Box 36, Luseland S0L 2A0
Betsy Haug	314 Egbert Ave., Saskatoon S7N 2A0
Merv Hey	104 Dunlop St., Saskatoon S7N 2B5
Lance Irvine	85-3rd Ave. N., Yorkton S3N 1C2
Brian Irving	Box 727, Kelvington S0A 1W0
Ron Jensen	849-10th Ave., Swift Current S9H 2T4
George Mitchell	4322 Castle Rd., Regina S4S 4W3
Christine Pike	Box 117, Waseca S0M 3A0
Randy Schmidt	518 Wathaman Cres., Saskatoon S7K 4P9
Frank Scott	R.R. 3, Saskatoon S7K 3J6
Tim Tokaryk	3816 Grassick Ave., Regina S4P 3V7

REGIONAL DIRECTORS

Ray Belanger	412 McGillvary Dr., Weyburn S4H 1M1
Donald Hooper	Box 40, Somme S0E 1N0
Ardythe McMaster	306 Brock St., Winnipeg, Manitoba R3N 0Y9
Christine Pike	Box 117, Waseca S0M 3A0

PRESIDENTS OF LOCAL SOCIETIES

Fort Qu'Appelle	Ronald Hooper	Box 757 S0G 1S0
Hudson Bay	Donald Hooper	Box 40, Somme S0E 1N0
Indian Head	Vic Beaulieu	Box 1213 S0E 2K0
Melfort	Phil Curry	Box 1115 S0E 1A0
Moose Jaw	Ed Walker	1071 Laurier St. S6H 2W6
Prince Albert	Carman Dodge	Box 1933 S6V 6J9
Regina	Phyllis Ilsley	#5-2345 Rae St. S4T 2G3
Saskatoon	Pat Adams	Sub P.O. #6, Box 448 S7N 0W0
Weyburn	Joe Weisgerber	632 Stavely Cres. S4H 2L8
Yorkton	Warren Hjertaas	510 Circlebrooke Dr. S3N 2Y3

SASKATCHEWAN
NATURAL HISTORY SOCIETY

Second Class mail registration Number 1046
Please return unclaimed copies.
Return postage guaranteed.

Box 4348, Regina, Saskatchewan.
S4P 3W6

A32531